ELECTRICAL REVIEW

AUGUST 1958 PRICE 1s 6d

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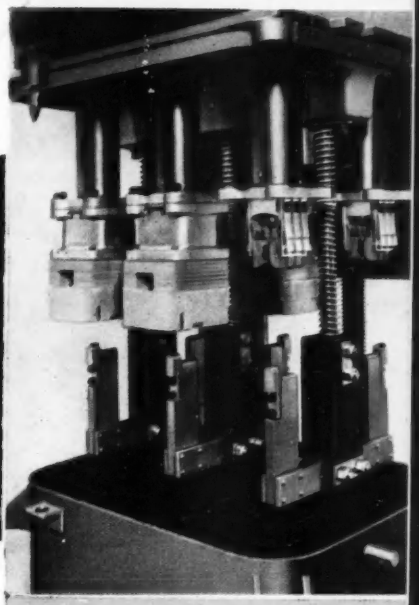

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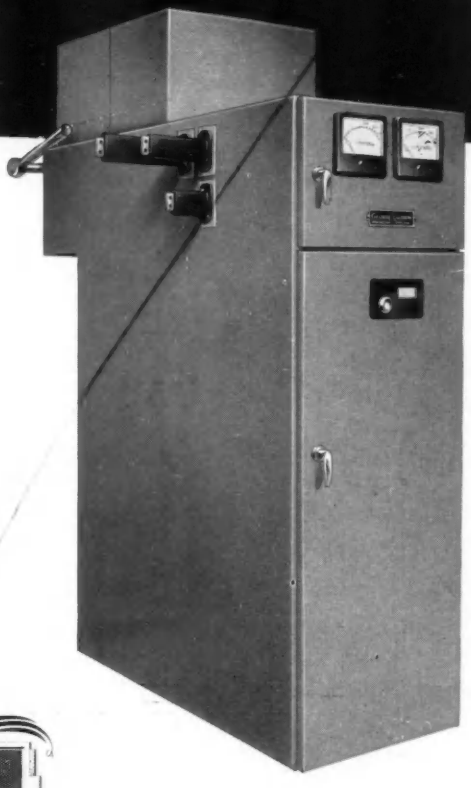

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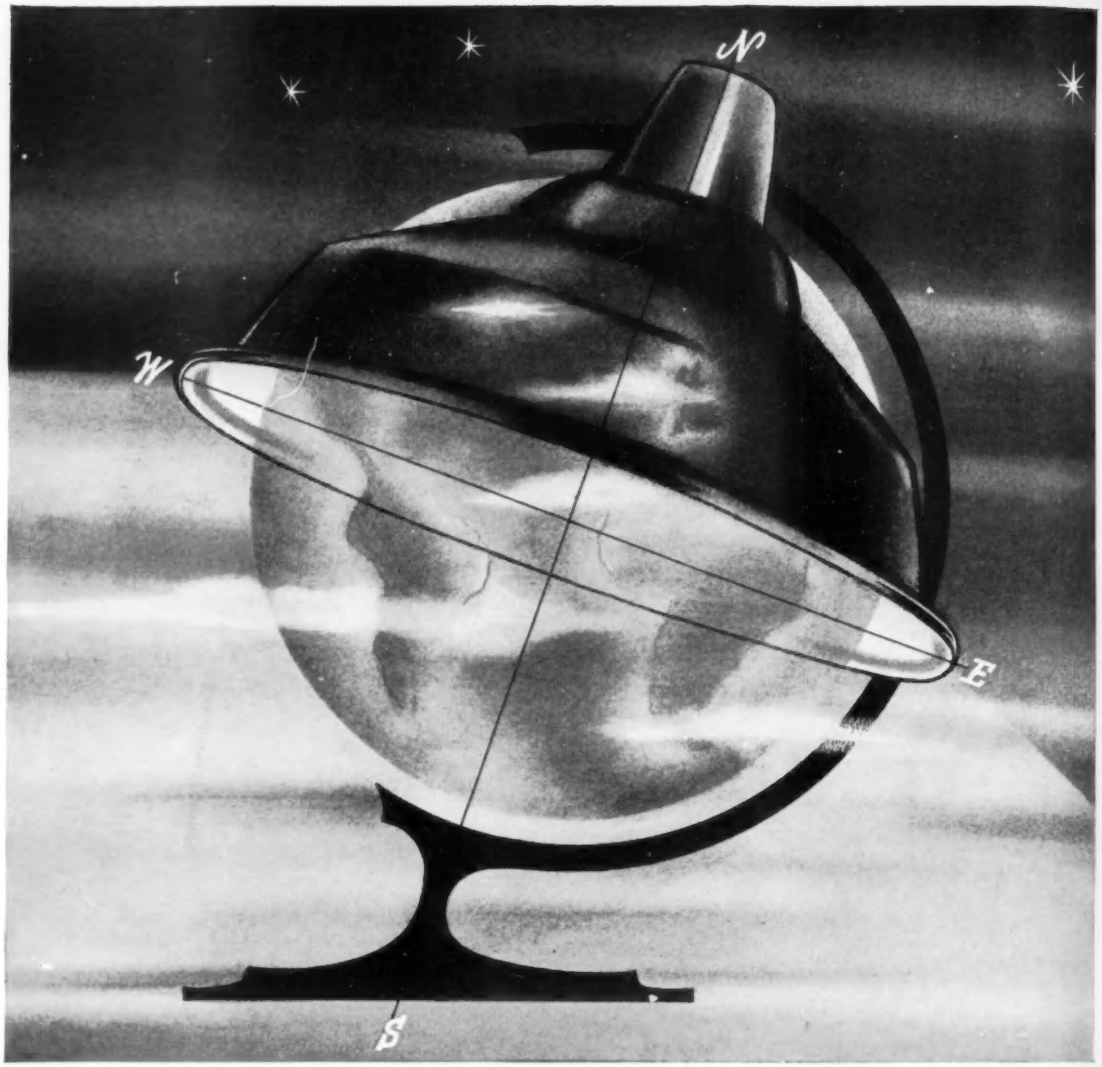

A word or two on illumination

A switch is pressed in the home . . . night shifts of Industry concentrate on intricate problems . . . across the globe hundreds of thousands of fans roar at floodlit soccer matches . . . ports and dockyards work on throughout the night. In these, and countless other ways, Benjamin Lighting Fittings are efficiently and reliably carrying out their tasks all over the world.

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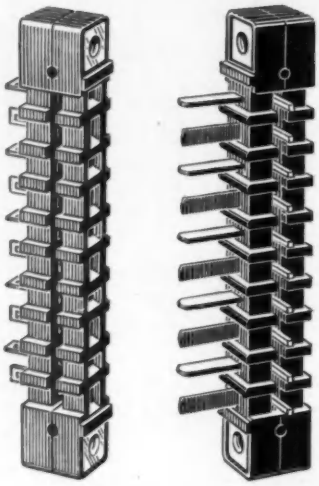
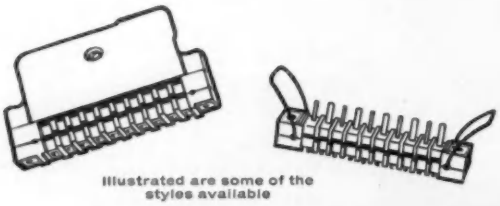
THE NEW "MICROCON" PRINTED CIRCUIT CONNECTORS

Microcon Printed Circuit Connectors are designed to meet the requirement for a light, compact, multi-way plug and socket, giving greater reliability and longer life than the edge connector method. Other patterns will soon be available, as well as the ten-way connector shown here.





Illustrated are some of the styles available

The pitch of soldering tags is suitable for a board punched to a standard module of 0·1".

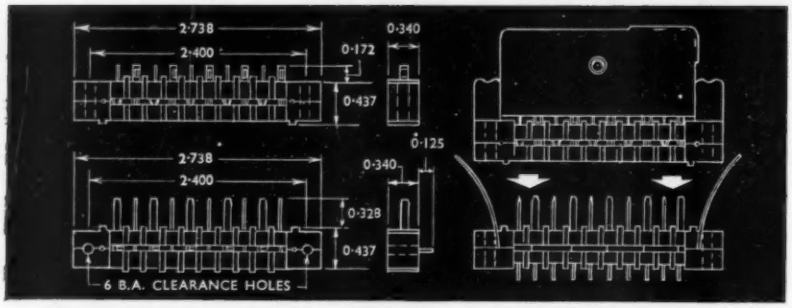
Two types of plug are available—the first has the solder tags orientated at 90° to the contact blades, the second has solder tags that are a continuation of the blades.

A metal cover can be fitted to either the plug with the straight blades or to the socket, and the mating unit can be supplied with wire retaining loops.

The two-part diecast cover, whose inner surfaces are insulated against short-circuiting, allows the connections to be checked physically and electrically without disturbing the clamping of the cable.

For polarizing purposes, when several connectors are mounted in close proximity, one or more contacts can be removed from each plug in various combinations, the corresponding contact in the mating socket being blanked off by special polarizing keys.

Write for technical leaflet



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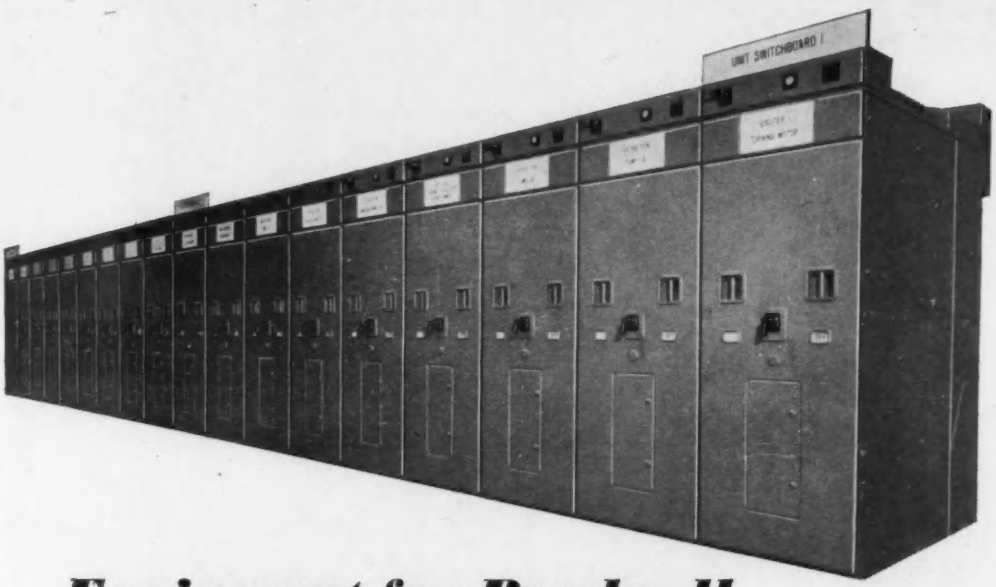

Equipment for Bradwell

All the switchgear comprising the main 132-kV air-blast circuit-breakers, 6·6-kV, 3·3-kV, and 415-volt air-break equipment for auxiliary supplies, together with its associated control apparatus for Bradwell Nuclear Power Station is being supplied by Reyrolle who are responsible also for the reactor control-rod heads, the fission-products detection equipment, and the machining of the graphite blocks.

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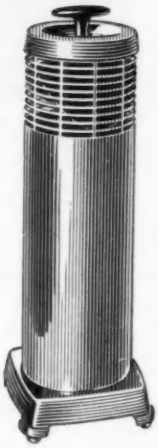
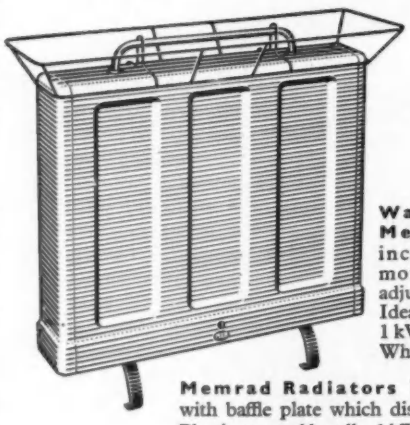
Memvair Convectors Attractive modern design; lovely Bronze finish. Completely safe even with unattended children. Warm glow can be seen through grille. Made in 1, 1½, and 2 kW ratings.



Circulair 1kW convector is ideal for smaller rooms. Easily carried anywhere in the house. Cheap to run. In Mushroom, Bronze or Eau-de-Nil finishes.



Wall-mounting Memray incorporates a special mounting bracket and adjusting cord. Rust-proof reflector. Ideal for bathroom or kitchen. Rating 1 kW. Alternative finishes of Cream, White, Primrose and Eau-de-Nil.

Memrad Radiators have tubular heating element with baffle plate which disposes heat evenly over casing. Plastic covered handle. 1 kW rating. Finished in Mushroom with lifting handle and feet in red. Chrome detachable rail for drying clothes can be supplied as an extra.

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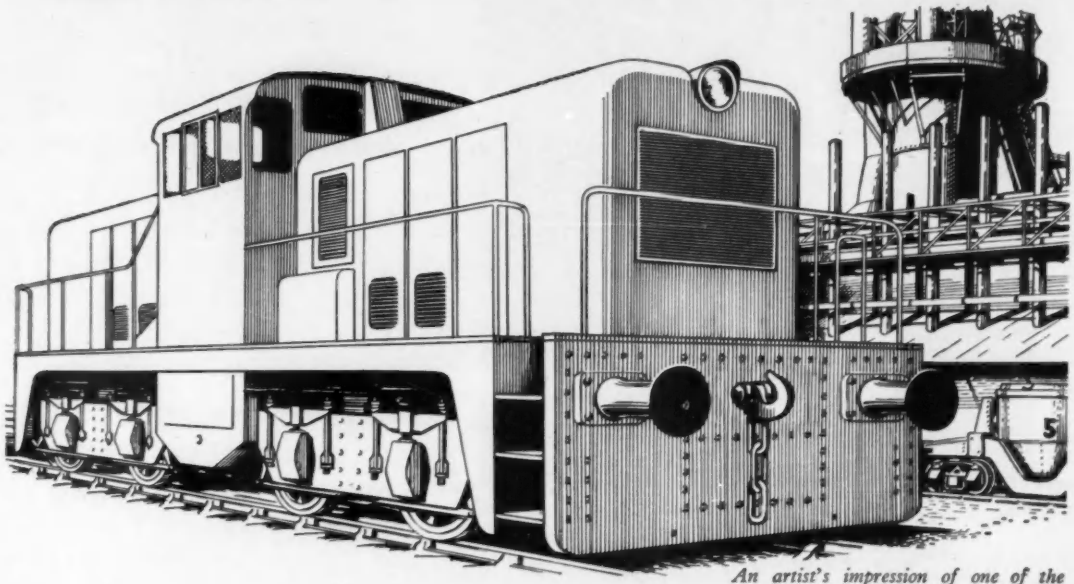
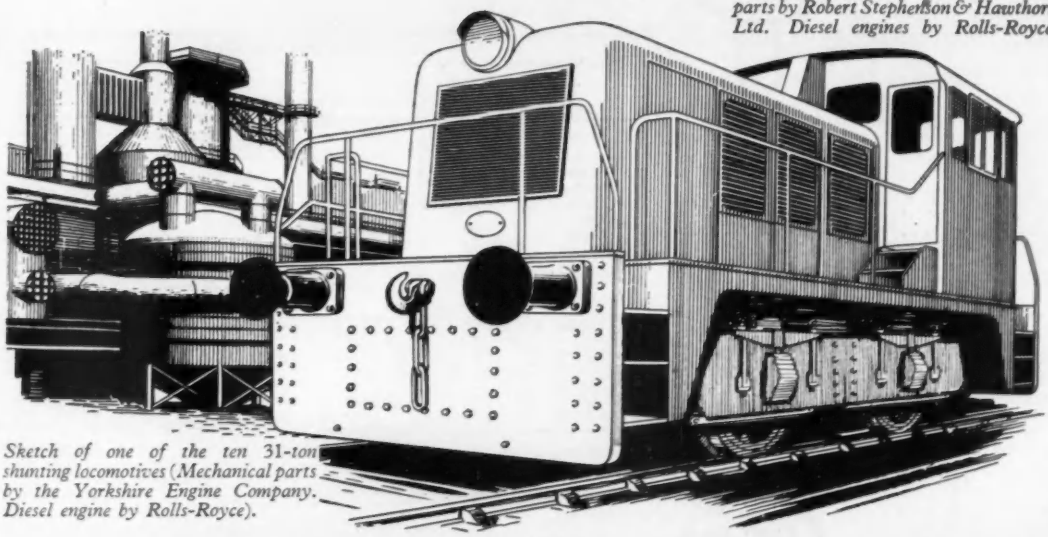


An artist's impression of one of the thirteen 72-ton locomotives (Mechanical parts by Robert Stephenson & Hawthorns Ltd. Diesel engines by Rolls-Royce).



Sketch of one of the ten 31-ton shunting locomotives (Mechanical parts by the Yorkshire Engine Company. Diesel engine by Rolls-Royce).

British Thomson-Houston, as a constituent Company of the Indian Steelworks Construction Company (ISCON), has in hand orders for a total of 23 diesel-electric locomotives for use in the Government of India's Durgapur Steelworks. The electrical equipment of the thirteen 72-ton Bo-Bo units and ten 31-ton 0-4-0 units will be of BTH design and construction throughout.

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TYPE	NOM. VOLTAGE	TYPE	NOM. VOLTAGE	TYPE	NOM. VOLTAGE
Z2A33	3.3	Z2A33	3.3		
Z2A36	3.6			Z2A33	3.3
Z2A39	3.9	Z2A39	3.9		
Z2A43	4.3				
Z2A47	4.7	Z2A47	4.7	Z2A47	4.7
Z2A51	5.1				
Z2A56	5.6	Z2A56	5.6		
Z2A62	6.2				
Z2A68	6.8	Z2A68	6.8	Z2A68	6.8
Z2A75	7.5				
Z2A82	8.2	Z2A82	8.2		
Z2A91	9.1				
Z2A100	10	Z2A100	10	Z2A100	10
Z2A110	11				
Z2A120	12	Z2A120	12		
Z2A130	13			Z2A150	15
Z2A150	15	Z2A150	15		

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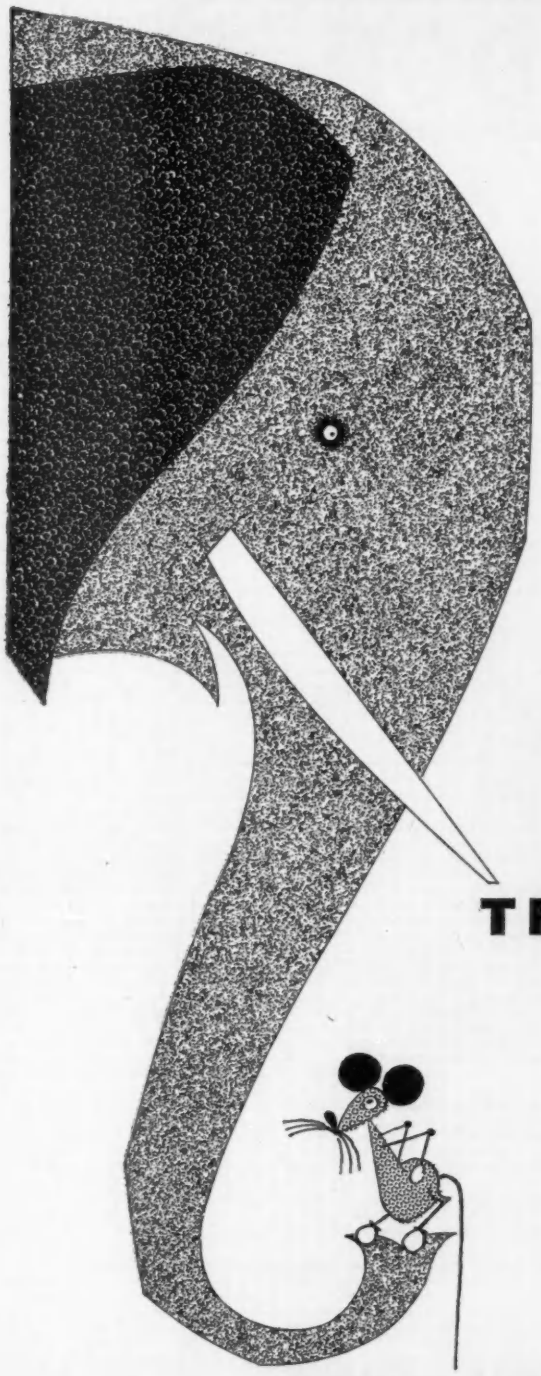

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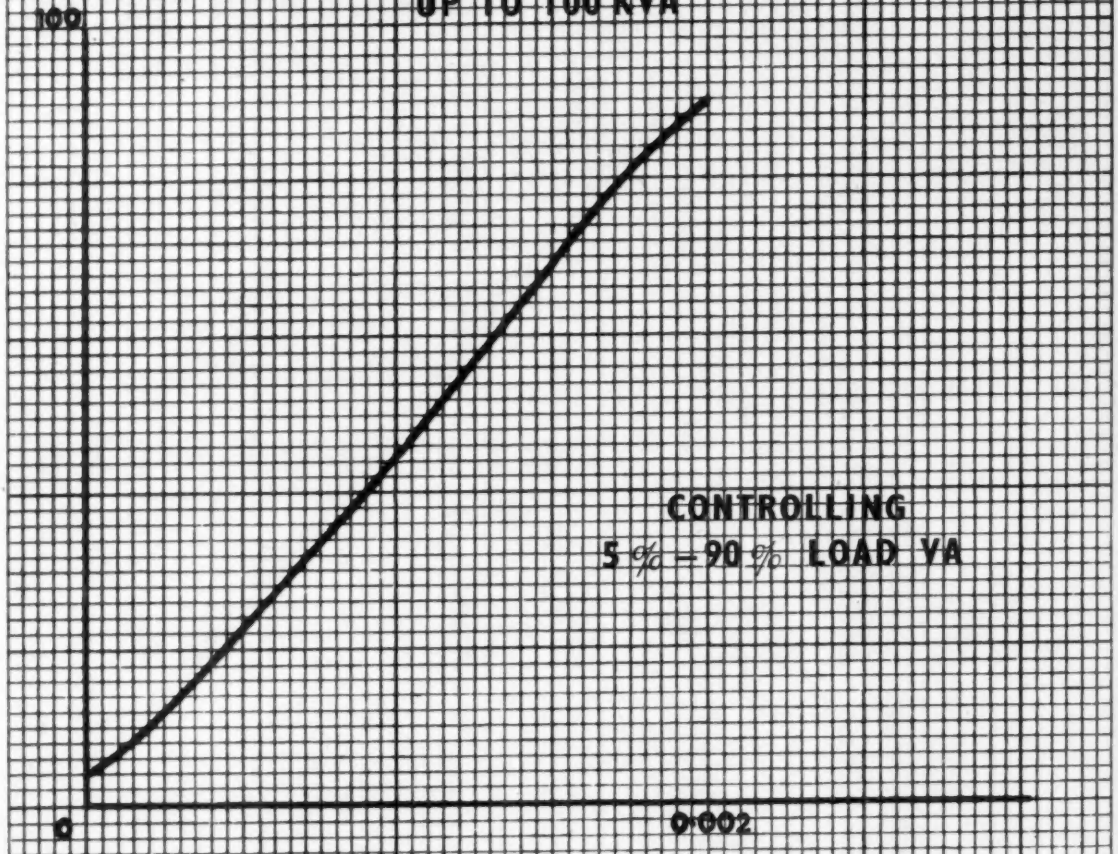

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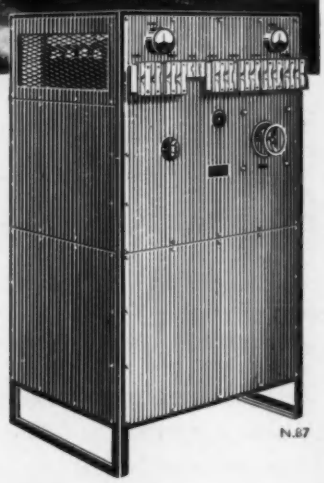

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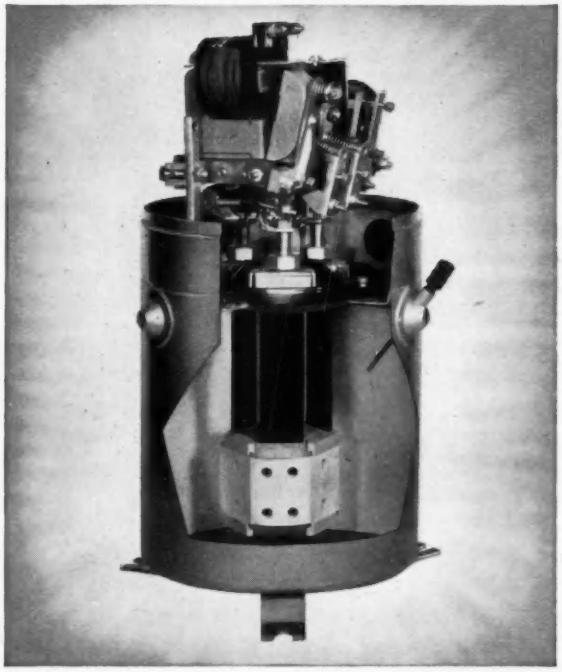

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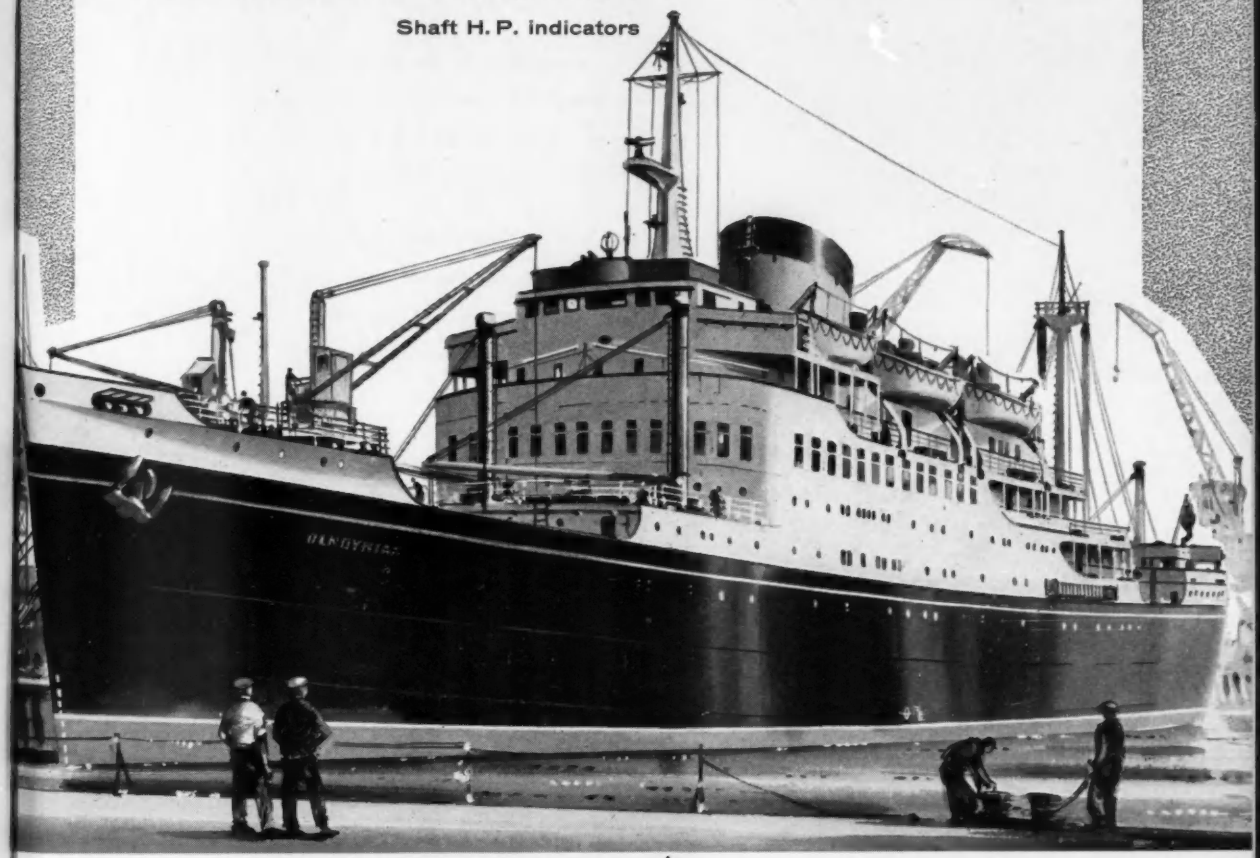

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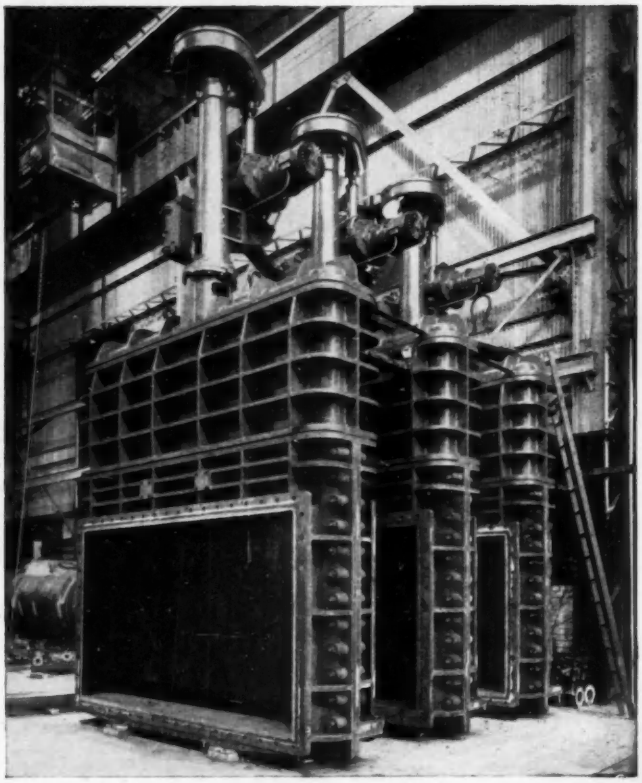

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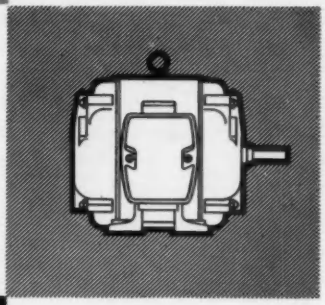

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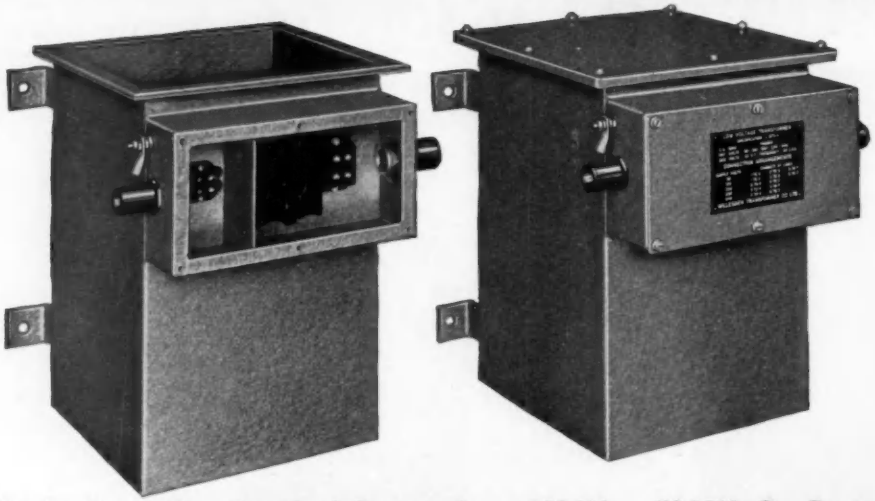

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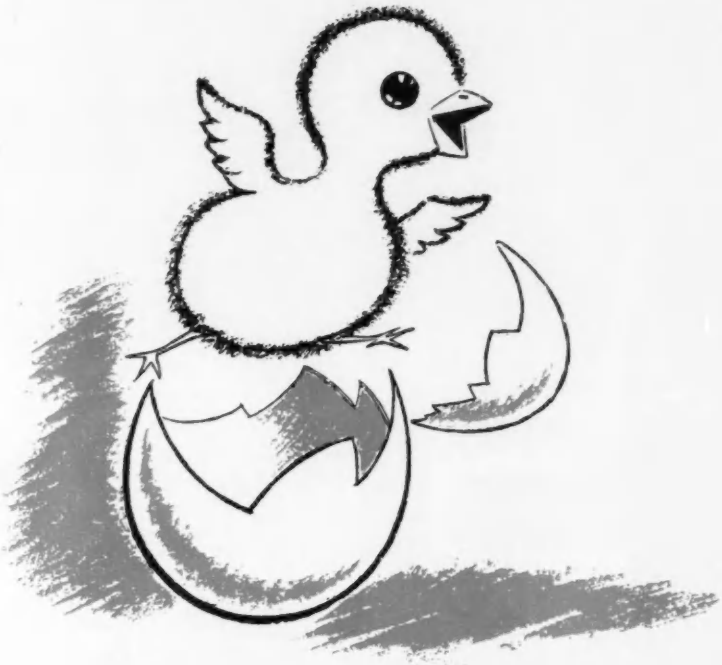

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Electrical Review
15 *August* 1958

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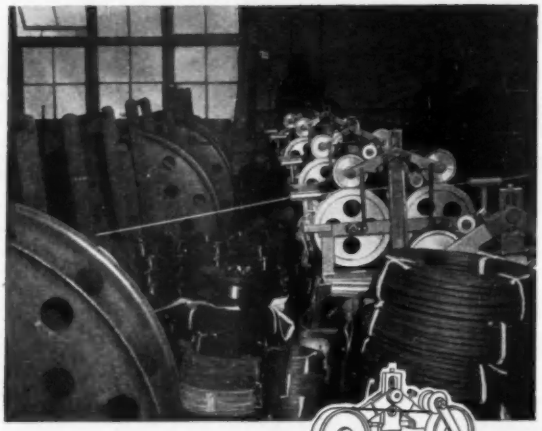

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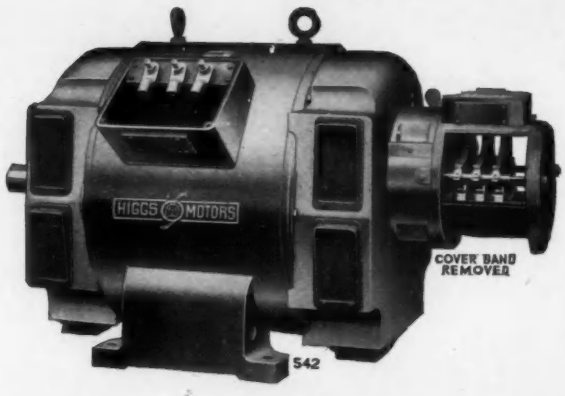
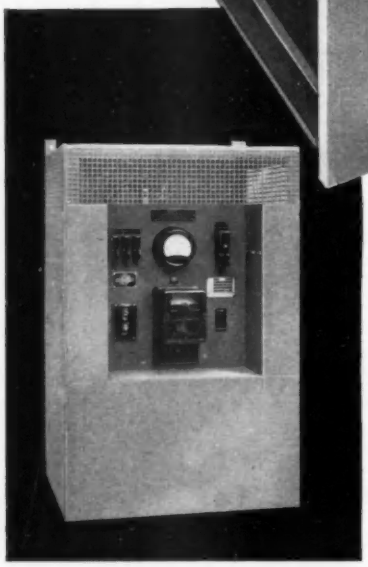


SLIP-RING and HIGH TORQUE MOTORS up to 1000 H.P.

Guaranteed for Ever

AGENTS AND BRANCHES COVER THE WORLD



Re our Rectifiers...

Should you need really well designed, economic, dependable equipment for the supply of D.C. from A.C. mains; equipment that is produced with an eye to quality, it will be well worth your while to send an enquiry to Crypton of Bridgwater. This progressive Lancashire Dynamo company has earned an enviable reputation throughout the world not only for the pre-eminence of its products but also for its prompt, courteous and reliable service.

industrial rectifiers

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TELEPHONE: BRIDGWATER 2614 TELEGRAMS: CRYPTOQUIP BRIDGWATER
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A Member of the Lancashire Dynamo Group

7488

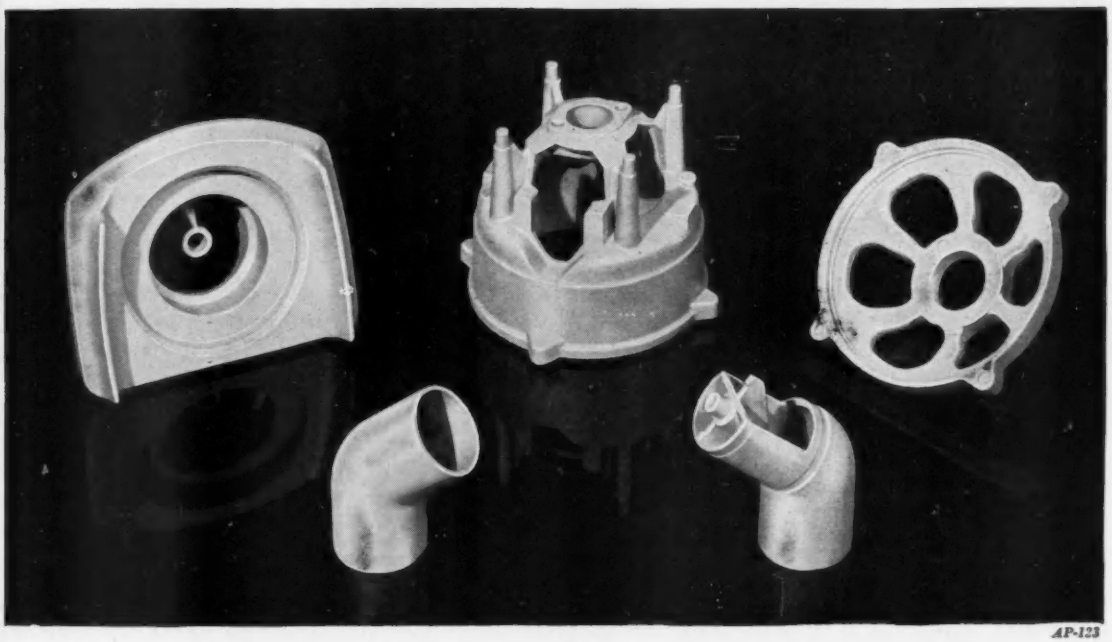
Electrolux cylinder type Suction Cleaner model 62 and accessories.

Aluminium Alloy Castings

by William Mills Limited

FRIAR PARK FOUNDRY · FRIAR PARK ROAD · WEDNESBURY · STAFFS.

Photographs by courtesy of Electrolux Ltd., London, W.1.



AP-123

Catalogue giving full details available on request

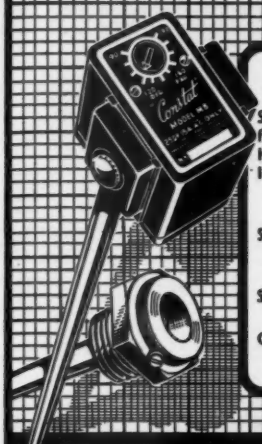
the long and the short of it

is the DIACAM ROTARY SWITCH will meet your need whether the circuit is simple or complex. This versatile switch will provide the answer to your control problems and is particularly suitable for motor applications.

CONTROL DEVICES

CRAIG & DERRICOTT LTD.
ROYAL WORKS, SUTTON COLDFIELD. Tel: Sutton Coldfield 2547

'Constat' CONTROLLERS



MODEL "MB"

STEM TYPE THERMOSTAT for control of IMMERSION HEATERS, PLATENS, DRYING OVENS, Etc.
Suitable for 15 amps, 250 V. A.C. only.
Standard Instrument 11" stem with ½" B.S.P. pocket.
Standard range 90/190° F and 30/90° C.
Other lengths and scales available

THE THERMOSTATIC CONTROLS Co
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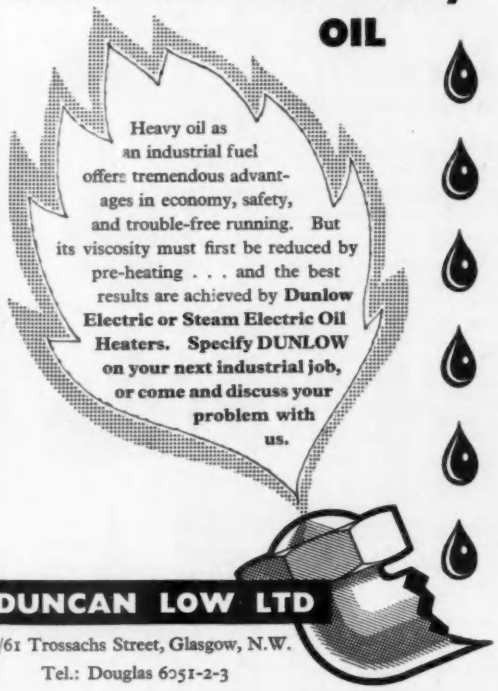
HEAT from heavy OIL

Heavy oil as an industrial fuel offers tremendous advantages in economy, safety, and trouble-free running. But its viscosity must first be reduced by pre-heating . . . and the best results are achieved by **Dunlow Electric or Steam Electric Oil Heaters. Specify DUNLOW on your next industrial job, or come and discuss your problem with us.**



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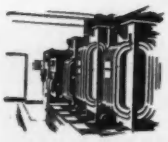
Tel.: Douglas 6051-2-3

BY APPOINTMENT TO HER MAJESTY THE QUEEN
Suppliers of Fire Extinguishers The Pyrene Company Limited

making the electrical world safer from fire



The many and varied fire dangers that are ever present in the electrical industries call for nothing less than the finest methods of fire protection. In this field, the highly developed and specialised Fire Detecting and Extinguishing Systems supplied by The Pyrene Company have a record and reputation second to none throughout the world. Whatever fire problems you have in your works—generating stations, transformer rooms, switchgear, cables — "Pyrene" Fire Protection provides the right answers.

Write for full details or instruct us to send a Technical Representative to give you expert advice without charge or obligation.

Pyrene TRADE MARK FIRE PROTECTION

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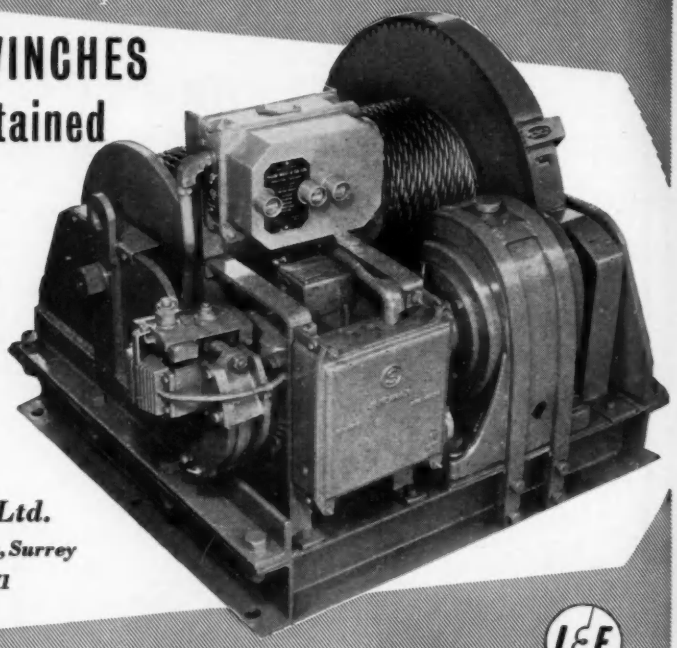
Tel.: VICTORIA 3401 *Head Office and Works:* BRENTFORD, MIDDX.
Canadian Plant: TORONTO

L.E.F. ELECTRIC WINCHES
portable & self-contained



After using one of these L.E.F. electric winches, Metropolitan Vickers Co., Ltd., of Manchester, found it so satisfactory that they placed an order for three more.

Portable, self-contained and capable of handling loads of up to 2½ tons, these winches are made with the skill and precision which characterises all L.E.F. winches.

Send for details of standard equipment or we shall be glad to manufacture to your special requirements.

London Electric Firm Ltd.

Brighton Road, South Croydon, Surrey

Telephone: Uplands 4871

L&F

Tib. 97

Bridge-Banbury
MIXERS

SIZE 11 BRIDGE–BANBURY

Produce the

Highest Output

more quickly, more efficiently, and guarantee a more uniform and

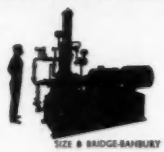
Highest Quality

mix. By minimising manual operating they produce at

Lowest Costs with the maximum degree of dependability and safety.

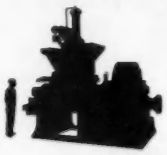
Consult our engineering service on layouts and machines for rubber and plastics. Our catalogue BB200 is yours for the asking.

In technical association with Farrel-Birmingham Co. Inc. U.S.A.

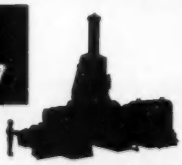


SIZE 8 BRIDGE-BANBURY

SIZE 3A BRIDGE-BANBURY



SIZE 9 BRIDGE-BANBURY



SIZE 27 BRIDGE-BANBURY

BRIDGE-BANBURY *Automation*

DAVID BRIDGE & CO. LTD., CASTLETON, ROCHDALE, LANCS

Phone: CASTLETON (ROCHDALE) 57216 Grams: Coupling Phone Castleton Lancs

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Lilliputian and Brobdingnagian

Gulliver would have been quite at home on our Stand at the Electrical Engineers Exhibition surrounded by pygmies and giants of the insulator world.

The photograph re-produced above illustrates the vast range of porcelain insulators manufactured by Taylor Tunnicliff & Co. Ltd.; the smallest shown measures ¼" x ¼" dia. and the largest 12 ft. x 2 ft. dia. From the smallest to the largest they are all backed by the skill and knowledge of ninety years manufacturing experience.

TAYLOR TUNNICLIFF & CO. LTD.

HEAD OFFICE: EASTWOOD · HANLEY · STOKE-ON-TRENT · TEL: STOKE-ON-TRENT 25272-5
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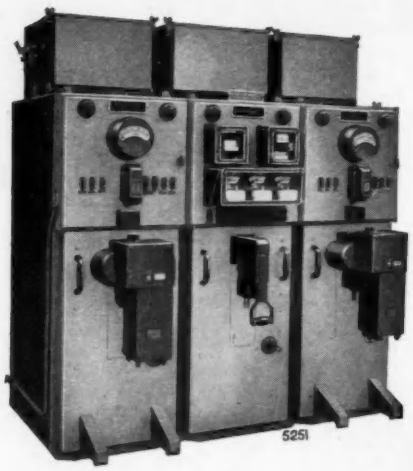
L&C

TYPE AVC

SWITCHGEAR

11 kV 150 MVA

A.S.T.A. CERTIFIED



AIR INSULATED
VERTICAL ISOLATION
HORIZONTAL DRAWOUT

LONG & CRAWFORD LTD.

GORTON ROAD - MANCHESTER 12

Smithlite
SUPER WONDER BATTEN

9 STAR FEATURES

- Now available in four sizes
- Fitted with standard "Smithlite" Supa-Choke
- Fully compounded and cased
- 5 ft. 80 watt and 4 ft. 40 watt chokes are tapped for 200/250 volts supply
- Entirely new design
- All sizes individually packed and the 5 ft. 80 watt in a strong fibreboard carton
- Constructed from rustproof steel and stove enamelled white
- Simple clip-on rigid lamp holder covers
- Already assembled, and wired for immediate installation

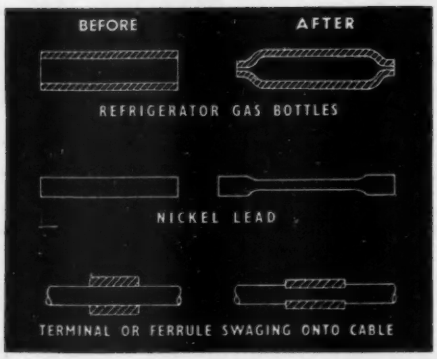
5 ft. 80 w. only £4 . 7 . 3
4 ft. 40 w. „ £3 . 17 . 9
3 ft. 30 w. „ £3 . 15 . 0
2 ft. 20 w. „ £3 . 4 . 0
PRICES DO NOT INCLUDE LAMP

HERMAN SMITH SMITHLITE LTD

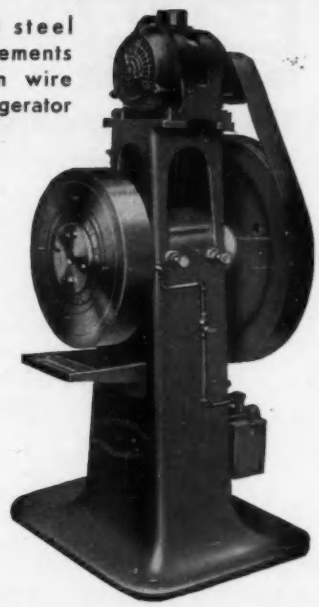
EMPIRE WORKS • DUDLEY • WORCS | TELEPHONE: DUDLEY 3178 (3 LINES) TELEGRAMS: SMITHLITE DUDLEY

What is Rotary swaging?

It is a means of reducing or pointing tube and rod by a hammering process



Reducing powder filled steel inconnel and copper elements Tungsten and Molybdenum wire for filaments. Necking refrigerator gas bottles.



TIME, MATERIAL AND MONEY IS SAVED

- No wastage of material
- Operated by unskilled labour
- Cheapest and Quickest method

SEND FOR FULL PARTICULARS—*It might solve your problem*

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Western Road · BIRMINGHAM 18

Telephone: NORthern 4514/5 and 0236
Telegrams: "Swager, Birmingham"

"The water's just as hot now, son, as when I started here"

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HOT WATER BY ELECTRICITY

The water heaters of a lifetime

The long service record of Sadia Water Heaters is outstanding. Sadia commercial (and domestic) appliances that were installed *more than 30 years ago* are still giving highly efficient results. Instant hot water without dirt or trouble regularly, reliably. That is the testimony of millions of satisfied Sadia owners. A guarantee of dependability for everybody who wants an electric water heater. Always recommend Sadia Water Heaters —they won't let you or your customers down. Sadia Water Heaters are quick and easy to install. Efficient and economical. From 1½-gallons to 120-gallons capacity.

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SADIA WORKS • ROWDELL ROAD • NORTHOLT • MIDDLESEX

SPECIALISTS IN HOT WATER BY ELECTRICITY SINCE 1923

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ESTABLISHED 1885
THE PORTABLE FURNACE & PATENTS Co
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Up to 50 Watts • Down to ± 1% Tolerance

PRECISION
WIRE WOUNDS
*At Competitive Prices!

G·A·STANLEY PALMER LTD
MAXWELL HOUSE, ARUNDEL ST., LONDON, W.C.2
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Combined Resources

The combination of General and Britannic—with pooled technical knowledge, research facilities and manufacturing plant—is of immense benefit to both organisations . . . and equally so to their customers! An even wider range of cables of greater fitness-for-purpose can be offered, a more comprehensive and co-operative service can be given to users in any part of the world, and fullest resources maintained to keep abreast of ever-advancing developments and techniques.

In the Leatherhead factory of General is produced a wide variety of cables for almost all ordinary purposes — VIR, PVC or polythene insulated, rubber or lead sheathed, asbestos braided and armoured. In addition, cables of many types are made for particular projects and to special requirements.

The Britannic factory at Iver manufactures EHT and LT paper insulated mains cables, varnished cambric, insulated cables for the electrical distribution, mining, ship building, transport and electrical contracting industries, as well as made to specifications for particular purposes.

All cables manufactured by General and Britannic conform to the relevant requirements of the British Standards Institution.

GCM

THE GENERAL CABLE MANUFACTURING CO. LTD.

LEATHERHEAD, SURREY

Telephone: Leatherhead 3021
Cables: Isolde, Leatherhead

BRITANNIC CABLES LTD.

IVER, BUCKS.

Telephone: Iver 491
Telegrams: Britannic, Iver

Flying Repairs. Repairs from overseas are not infrequent at the house of Collins. The above photograph shows two rotors, which had just arrived by air from the Middle East, being unpacked. A few days later they were again in B.O.A.C.'s charge on their urgent way back to another satisfied customer.

COLLINS

Collins Electrical Ltd.
Head Office 115 Clerkenwell Road London EC 1
Central London Works
22 St. Albans Place Upper Street Islington N 1
West London Works
9 & 11 Featherstone Road Southall
Phone Holborn 0212-4 Canonbury 3227-8
or Southall 0168

A vast new spin dryer market is now extended to every home in Britain

are you taking advantage of the SATURN'S popularity

Ever since national advertising introduced the SATURN Spin Dryer thousands of women have been clamouring for it. Because it's the Spin Dryer everyone can afford it opens up a vast new market and opportunities of fabulous new business.

If you're not yet stocking the Saturn how about ringing your wholesaler —today.

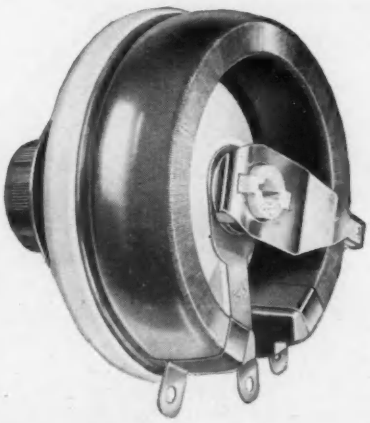
WORLD'S MOST PORTABLE SPIN DRYER AT ONLY

£21·17·6
TAX PAID

Manufactured by Thermair Domestic Appliances Ltd.
Selling Agents: The Brattel Electric Co. Ltd.
27 Old Bond Street, London, W.1 Phone: Hyde Park 8978/0

Can you say Toroidally Wound Rheostats twelve times quickly?

It's a bit of a mouthful but you need only say it once—preceded by the name 'Cressall'. Whether you require the vitreous enamelled Cressall 'Torostat' (illustrated below) of extremely robust ceramic unit construction or the well-known open-wound type of rheostat or potentiometer, you will find none better than Cressall.



Forty years' experience in design and manufacture ensure that each Cressall product has extra quality inbuilt.

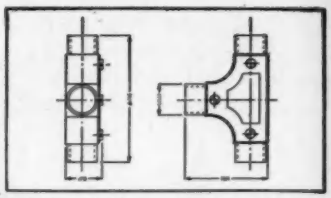
Write for Catalogue Section D, List 63.

Cressall
A.I.D. & A.R.B. APPROVED

THE CRESSALL MANUFACTURING COMPANY LIMITED
(A subsidiary of The Expanded Metal Co. Ltd.)

ECLIPSE WORKS · TOWER STREET · BIRMINGHAM 19 · TEL: ASTON CROSS 2666
LONDON OFFICE: BURWOOD HOUSE · CAXTON ST · S.W.1 · TEL: ABBEY 7766

Right from the first . . .



A job completed in METALLIC conduit is a job completed for good. METALLIC finishes ensure complete protection against corrosion, and will withstand bending without the slightest flaking. This durability, coupled with consistent accuracy, ensures easier installation and maintenance.

they're made to last . . . METALLIC **CONDUIT TUBES & FITTINGS**

A TI COMPANY

THE METALLIC SEAMLESS TUBE CO. LTD., LUDGATE HILL, BIRMINGHAM 3
ALSO AT LONDON, NEWCASTLE-ON-TYNE, LEEDS, SWANSEA & GLASGOW

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MICANITE COMMUTATOR *INSULATION*

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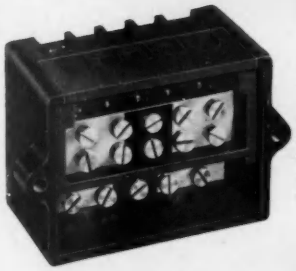
RINGWOOD RD., WALTHAMSTOW, LONDON, E.17
ESTD. 1912

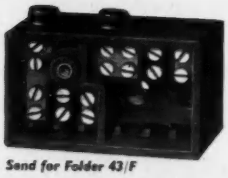
Phone: COPpermill 2248/9
Telegrams: Elmicmer, Easphone, London



For 3 cables up to .0225 sq. in. and 2 up to .04 sq. in. Removable compartment for the neutral connector facilitates wiring.

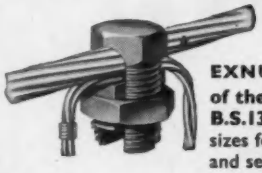
DOUBLE-POLE INSULATED CONNECTOR BOXES

Incoming, one cable up to .0225 sq. in.
Outgoing, one cable up to .0225 sq. in. and two up to .007 sq. in.
Fits directly below meter—no shield required.



Send for Folder 43/F

SERVICE TAPS



EXNUT
of the type illustrated in B.S.1320 : 1946. Range of 4 sizes for up to .20 sq. in. line and service wires.

NUT TYPE
Cheapest and most popular Service Taps. Range of 4 sizes for up to .10 sq. in. line and service wires.

SHROUDS
Available for both Exnut and Nut Type service taps.

Send for Leaflet 47/E

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ELECTRICAL
DISTRIBUTION EQUIPMENT

All enquiries in connection with Electrical Distribution to :

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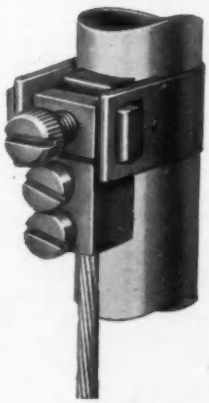
Engineering Sales Department :
59-62 High Holborn, London, W.C.1
Telephone : CHAncery 4361 Telegrams : "Henletel, Holb, London"

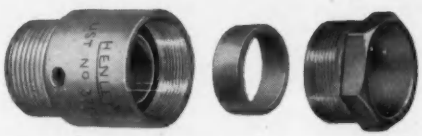
EARTHING CLAMPS



For use on metal pipes, etc.
Comprising only two parts and accommodating stranded conductor (as shown) or strip. Range of sizes up to No. 5 of B.S.951.

Send for Leaflet WSA/6

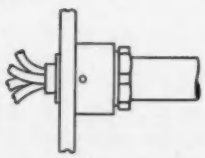
TERMINATING GLANDS



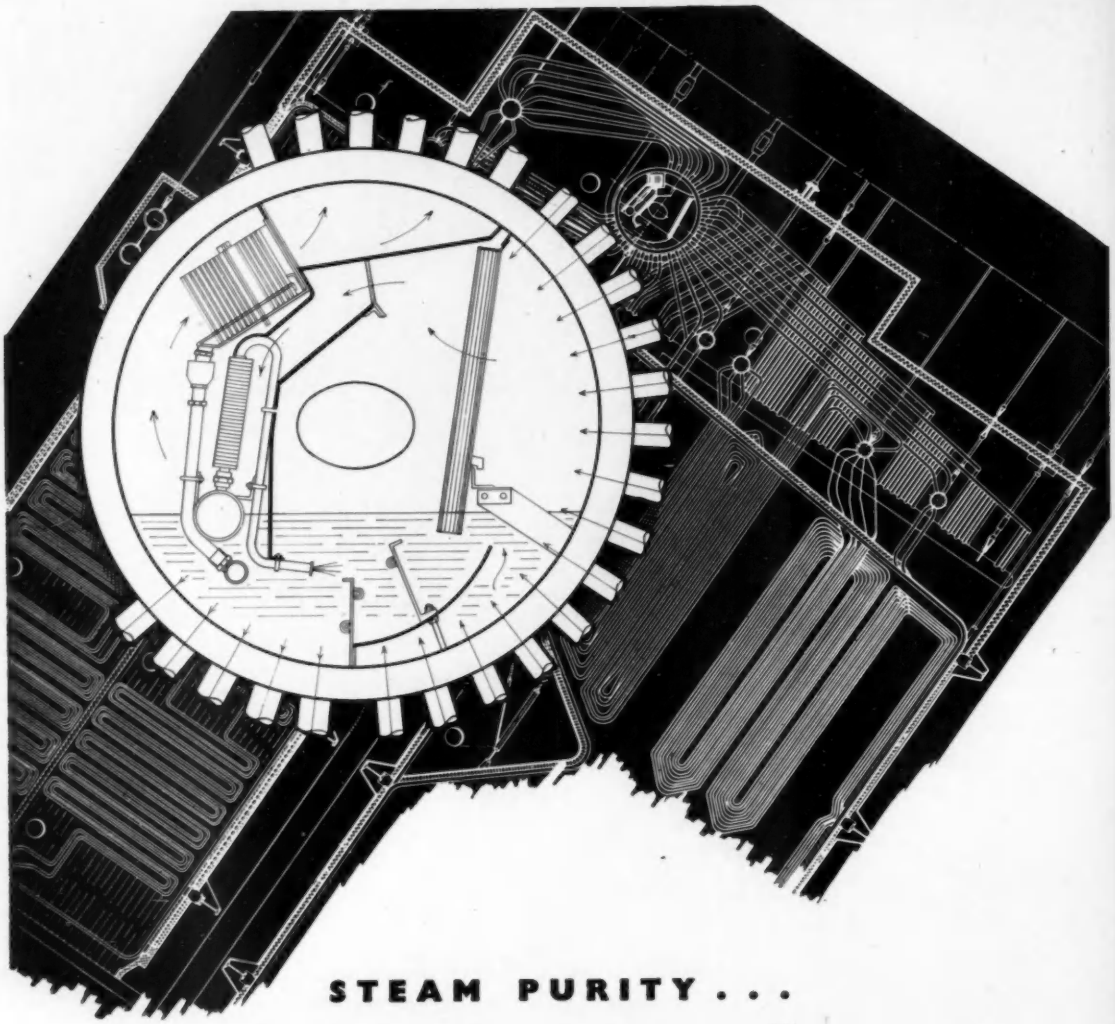
For P.V.C., Polythene or V.R., S.W.A. Cables. Range of 5 sizes for cables up to diameter over armour of 1.92 in. or over outer sheath or serving 2.15 in.

P.V.C. Shrouds available to cover the complete assembly.

Send for Folder 37/C



W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1



STEAM PURITY . . .

Exceptional steam purity with a minimum of Silica carry-over is being obtained from "Brown-Riley" Boilers equipped with our Condenser Type Steam Purifying System.

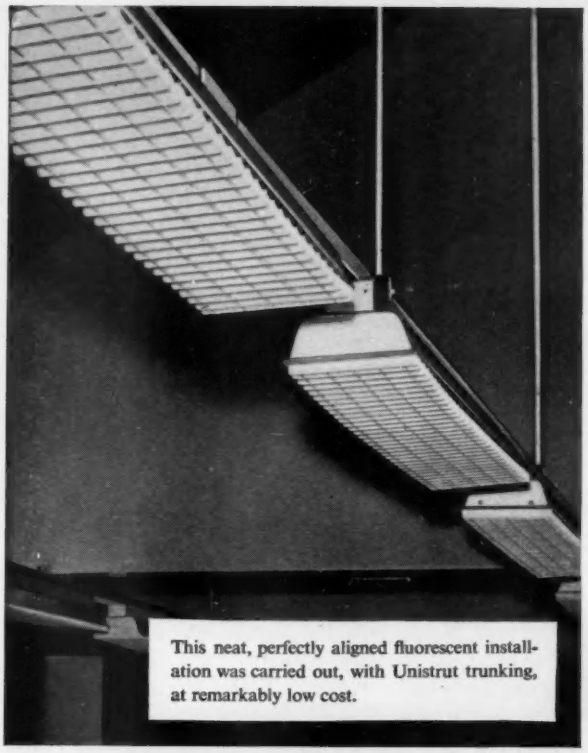
Steam purity well below 0.5 p.p.m. is consistently obtained.

With "Brown-Riley" Units the arrangement of baffles and primary separators ensures that the steam is liberated above the working water level, and effects definite and rapid separation of steam and water. Feed water passes through the Condenser Purifier so that the temperature of the Purifier Elements is lower than the steam temperature. A certain percentage of the steam is consequently condensed as it passes over the Purifier Fins and consequently impurities are washed away by the condensate. "Brown-Riley" Purifiers are ruggedly constructed and the design of the system permits easy installation and removal.

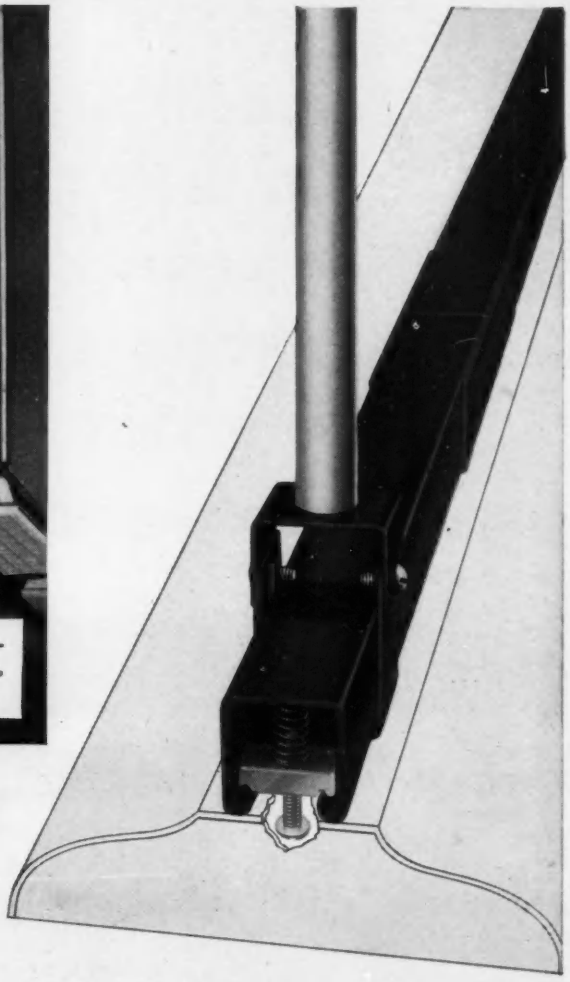
JOHN BROWN LAND BOILERS LTD

WHITECROOK • CLYDEBANK GLASGOW

London Office :
8, *THE SANCTUARY* *WESTMINSTER* *LONDON S.W.1*



This neat, perfectly aligned fluorescent installation was carried out, with Unistrut trunking, at remarkably low cost.



UNISTRUT

LOW-COST TRUNKING SYSTEM

For fluorescent installations—everywhere

The cheapest method for continuous trunking of fluorescent fittings is also the *best*—fastest, safest, *and* neatest. The special channel section offers greater resistance to deflection, and allows long runs to be assembled and hung with unusually few hangers. The *self-locating* Unistrut nut, in combination with the continuous-entry channel, adds a facility for future repositioning of the fittings, in situ, to the *immediate* advantage of rapid, positive assembly. The finished job is extremely neat, with concealed wiring and perfect alignment of the fittings. Maximum economy is effected by rapid erection without drilling, etc., using only 5 standard components.

Unistrut trunking is part of a very successful American support system which gives similar benefits—speed, strength, variable arrangement, and economy—in many electrical applications:—e.g. cable and conduit runs, meter and switchgear mounting, storage, etc.

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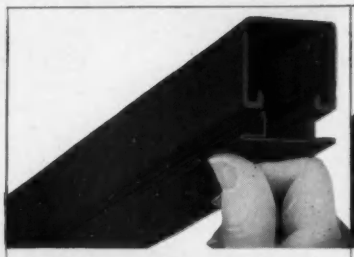

Clip-on cover protects against dust and damage, completes the installations neat appearance.

20 ft. Unistrut channels are quickly joined to make desired span.

HOW UNISTRUT GIVES CONTINUOUS SPAN... PERFECT ALIGNMENT... COMPLETE SECURITY

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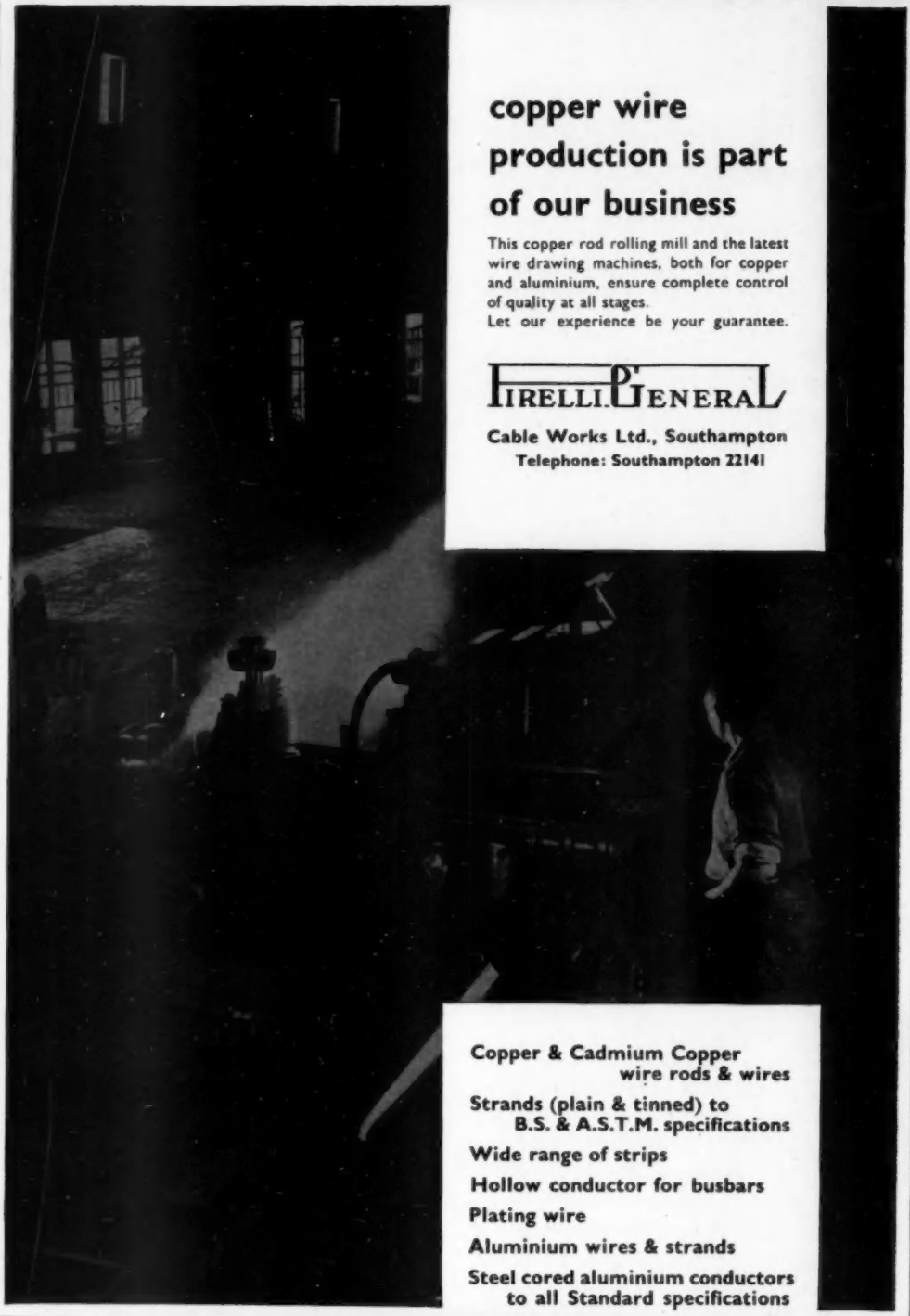
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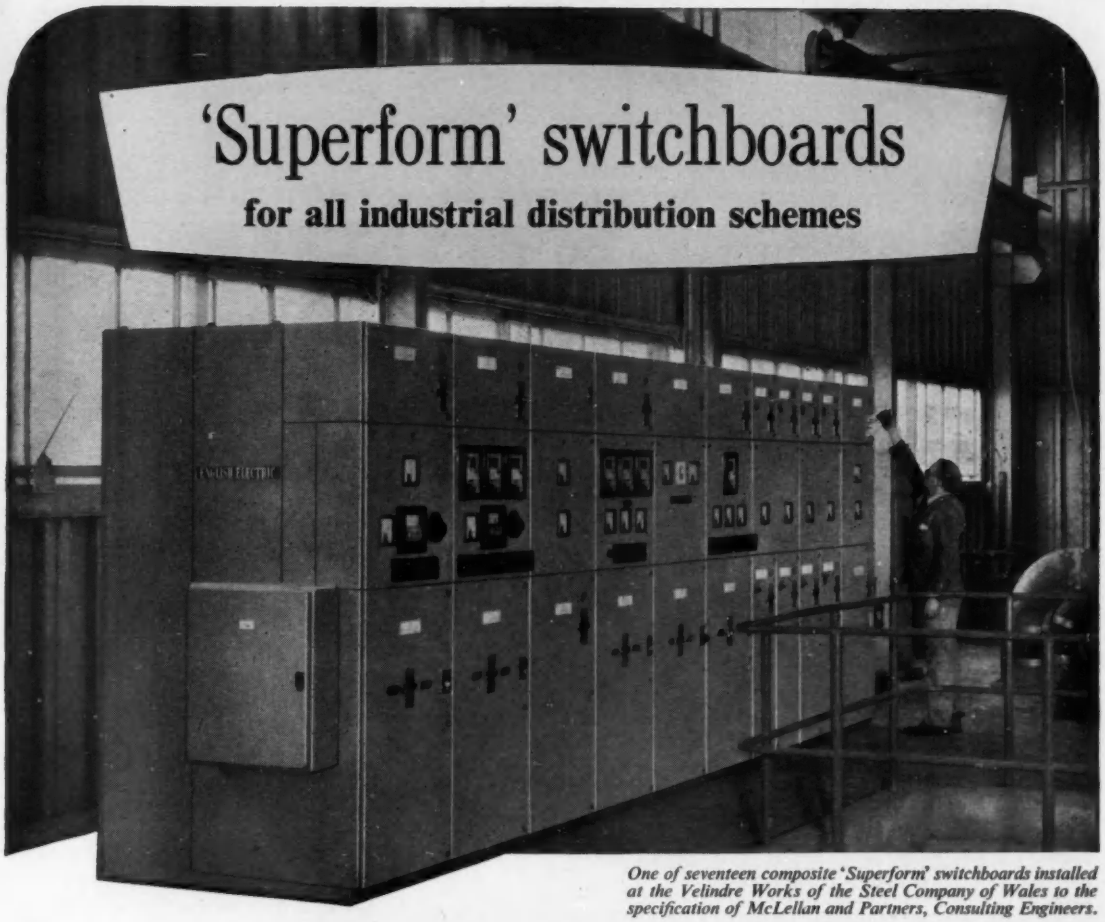

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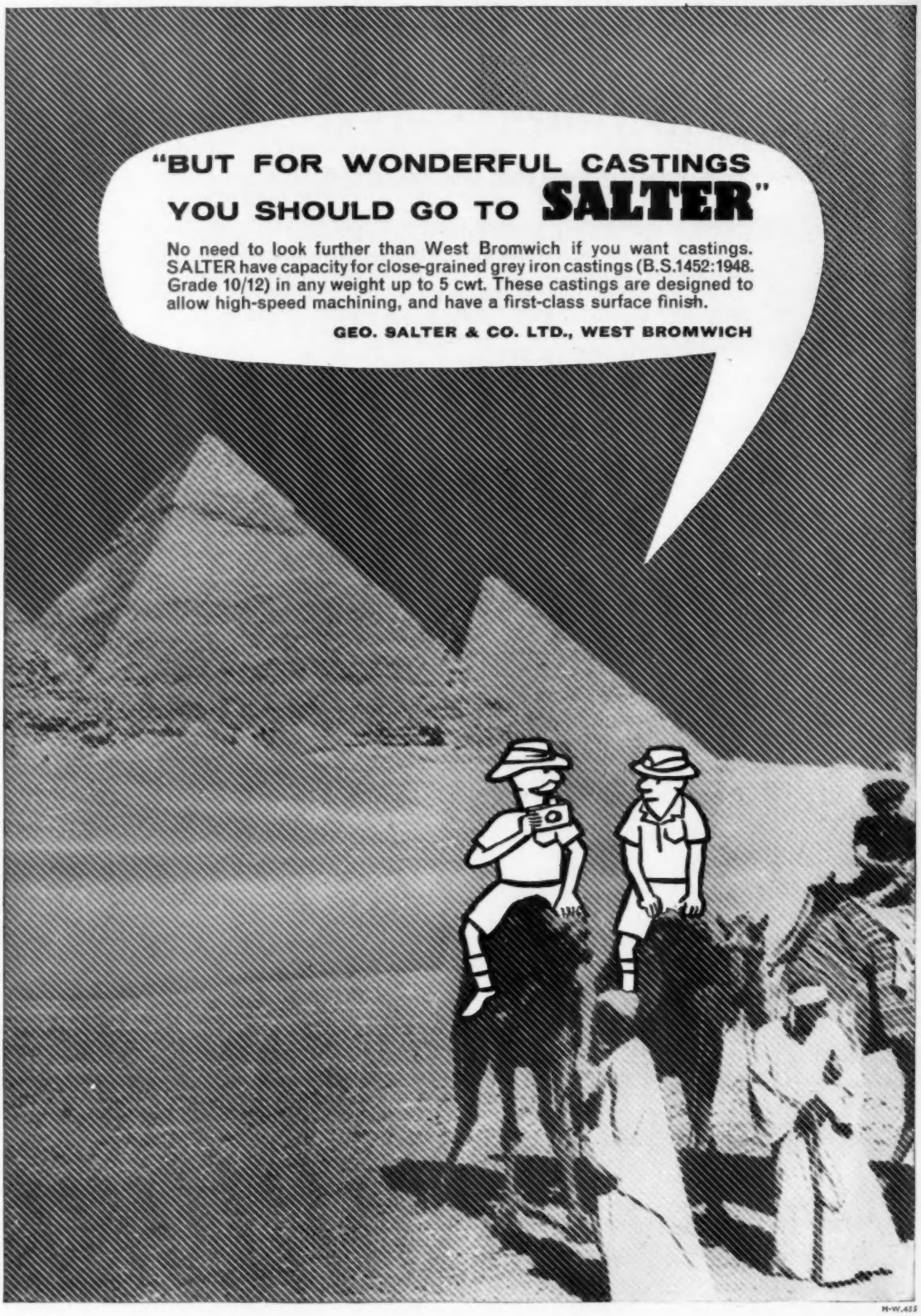
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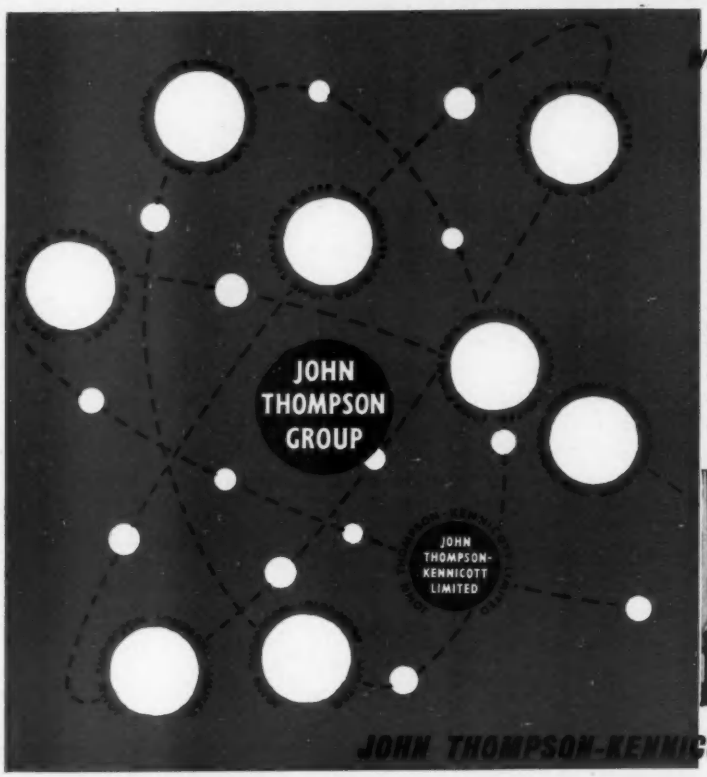

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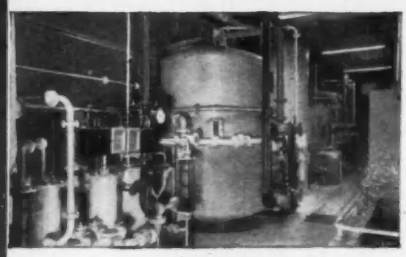

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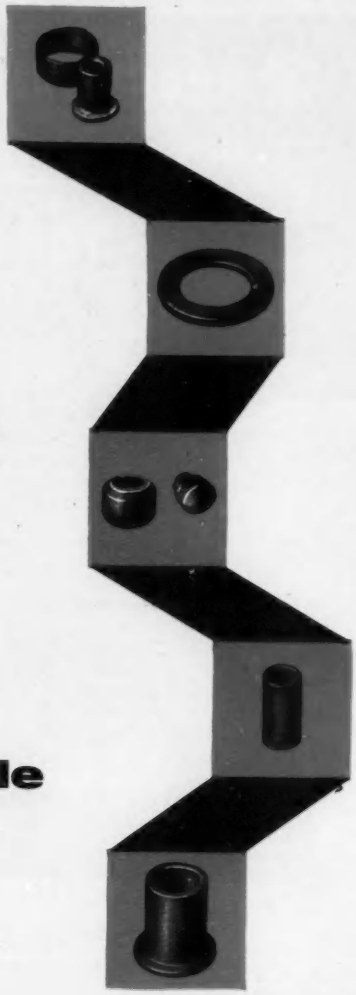

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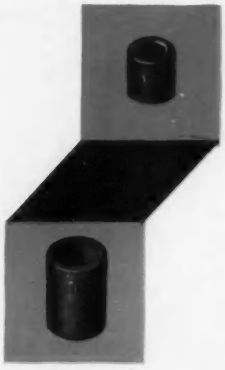

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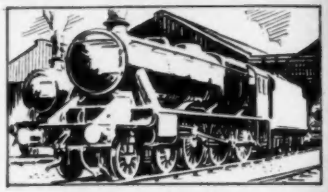

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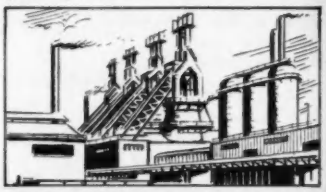

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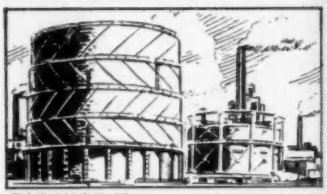

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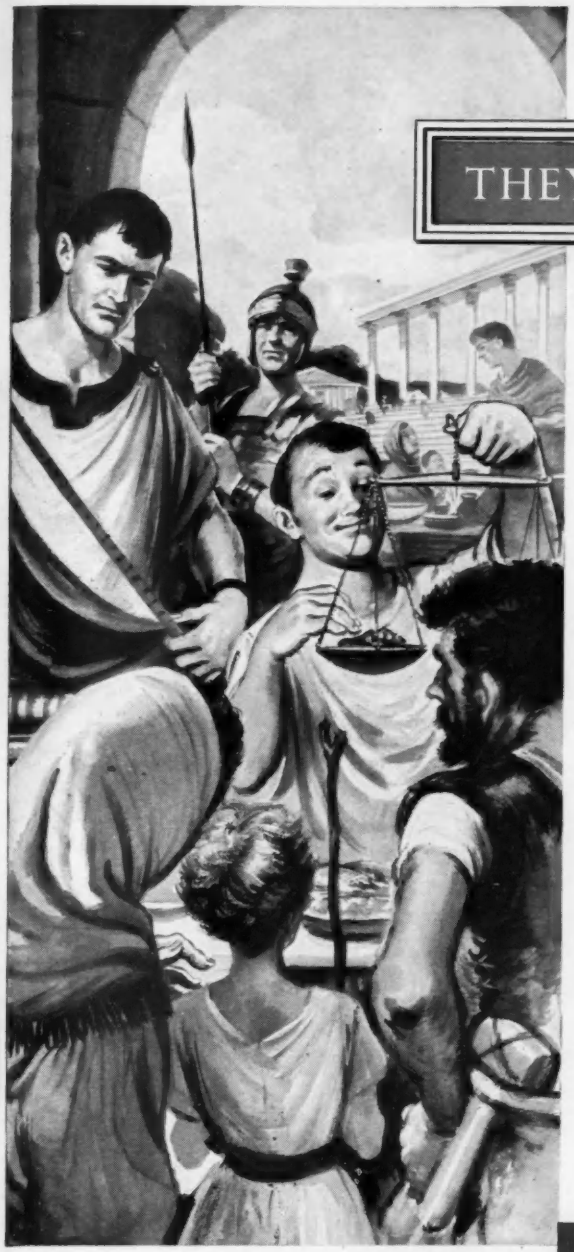

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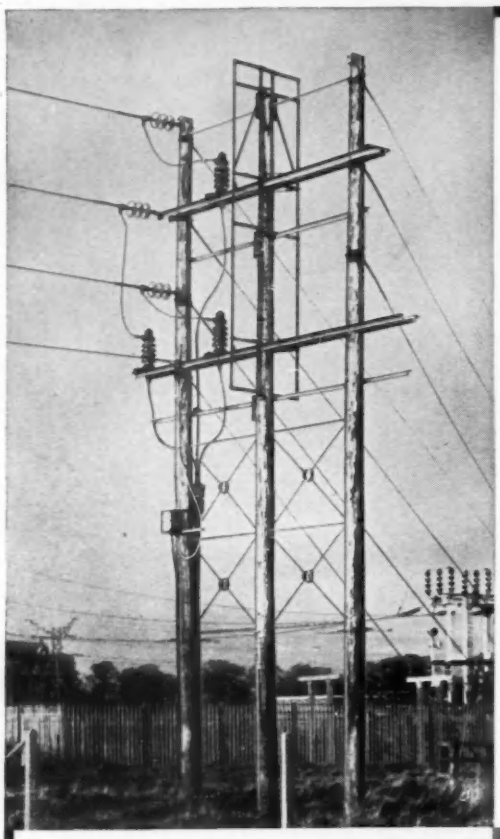

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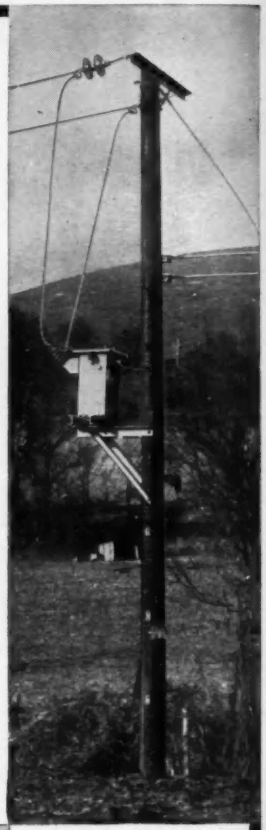

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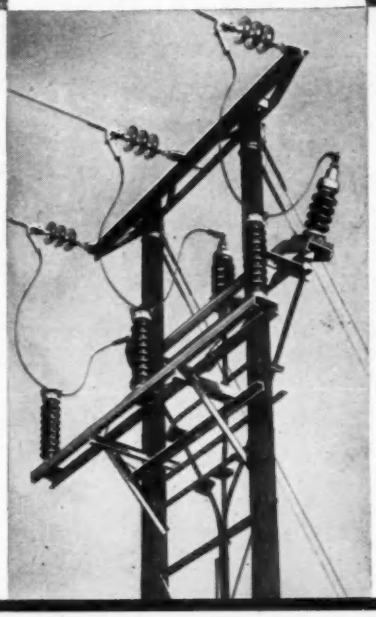

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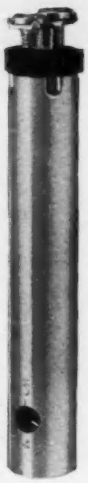

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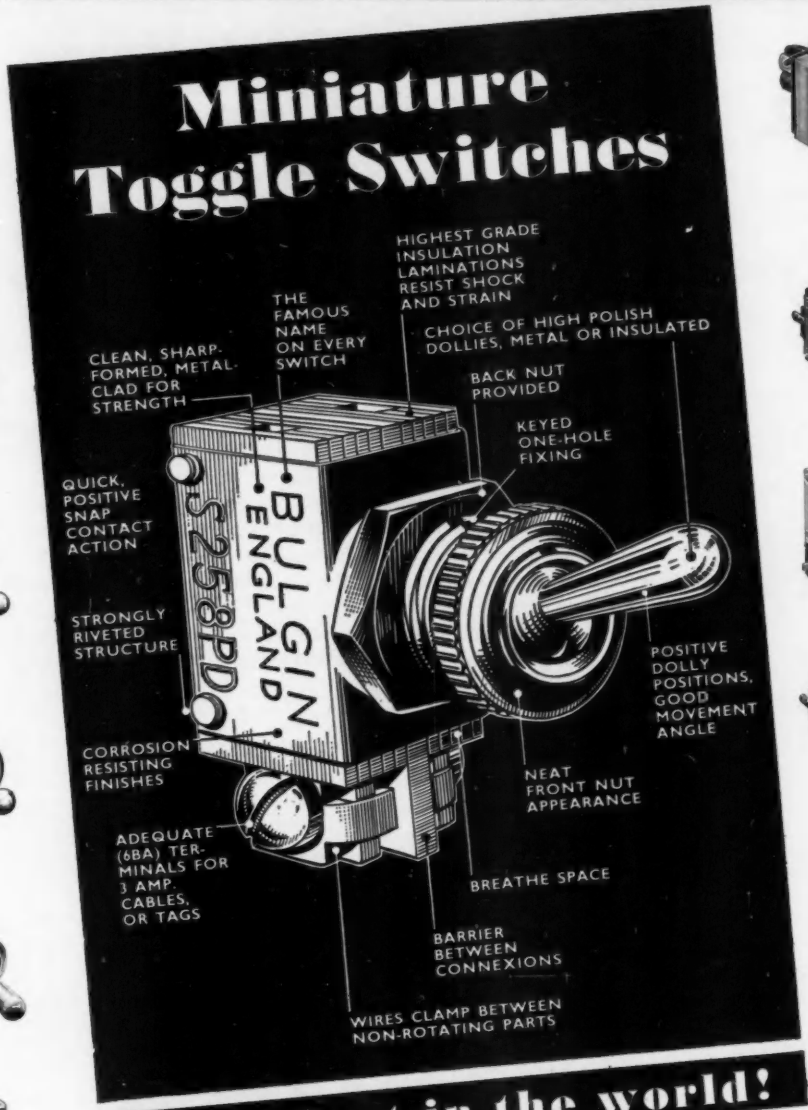
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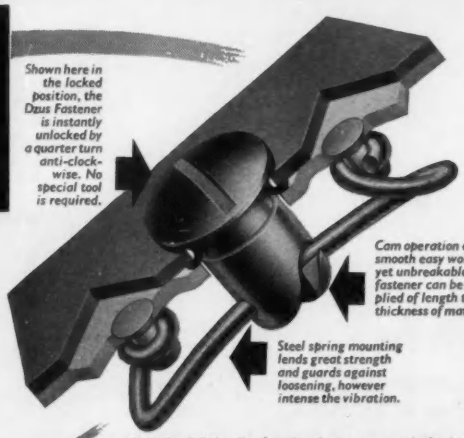

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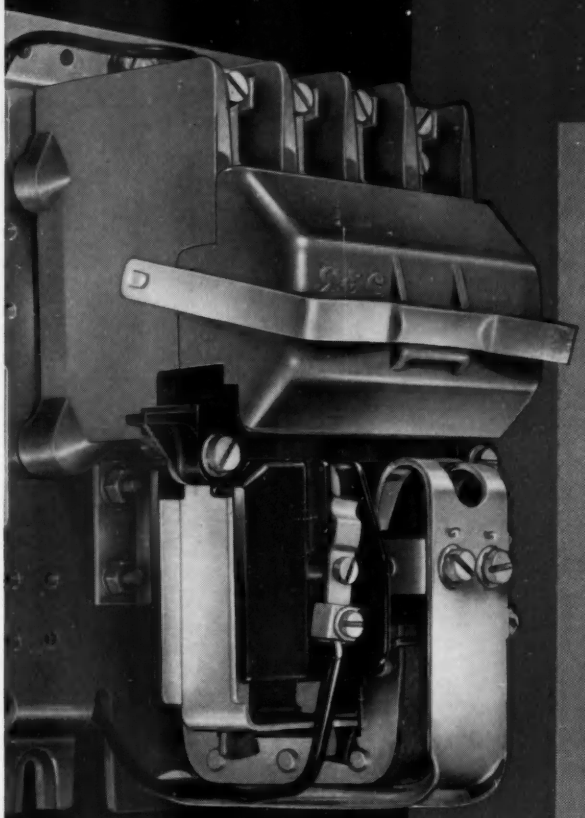

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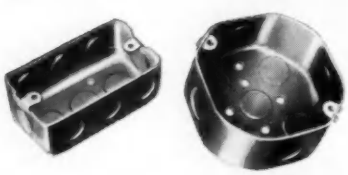

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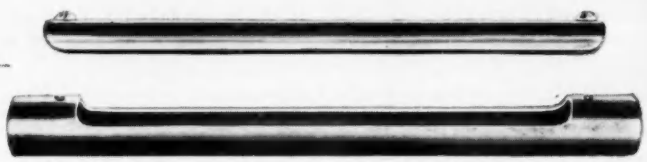

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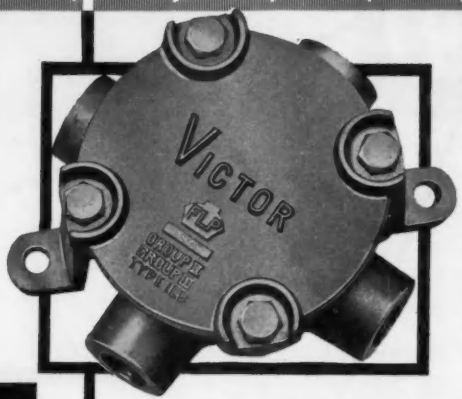

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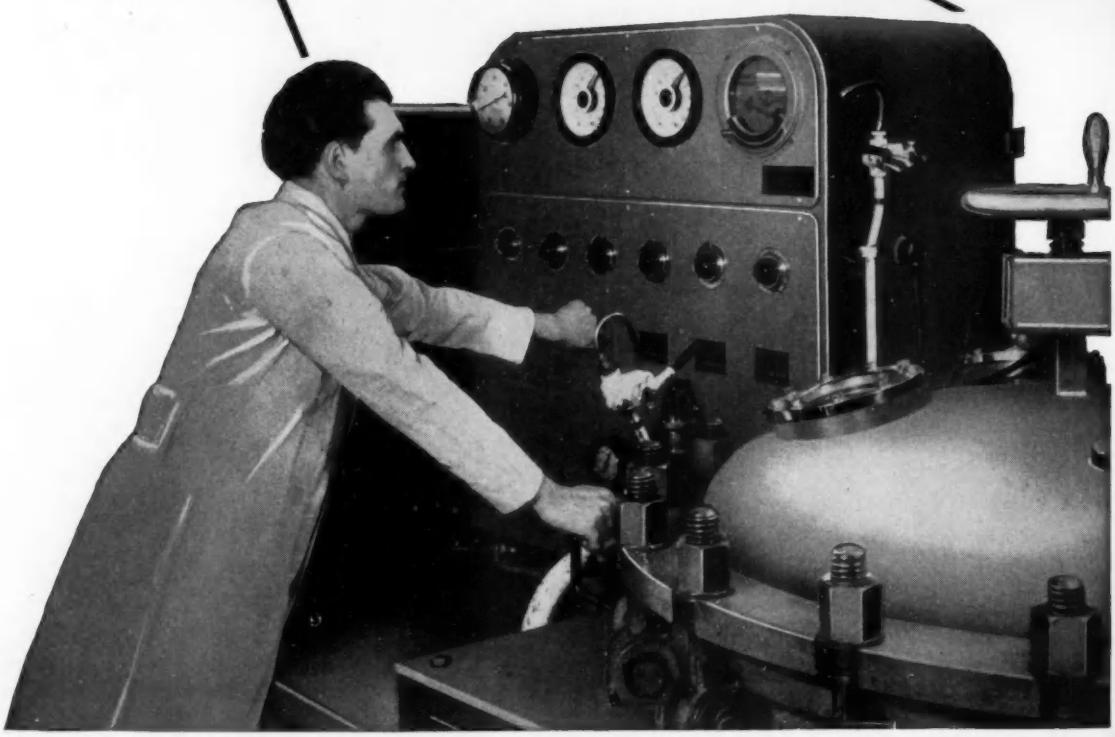

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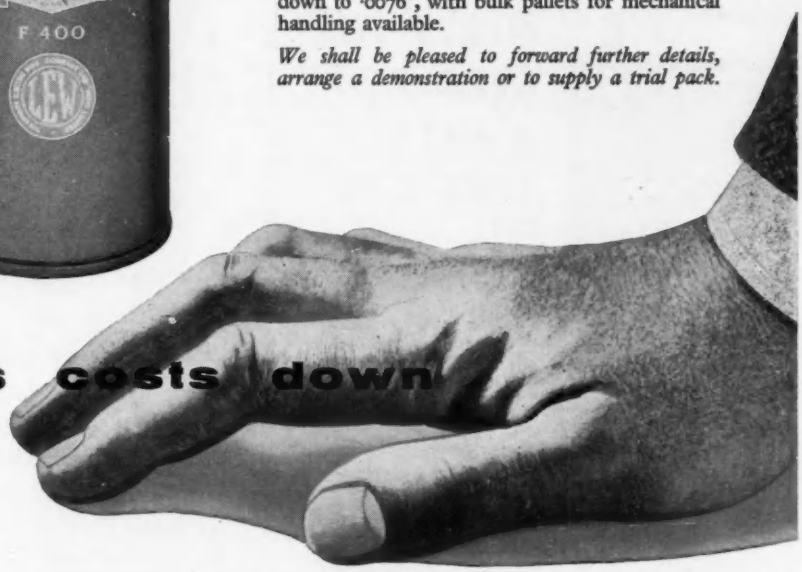

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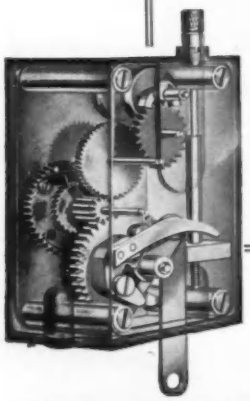

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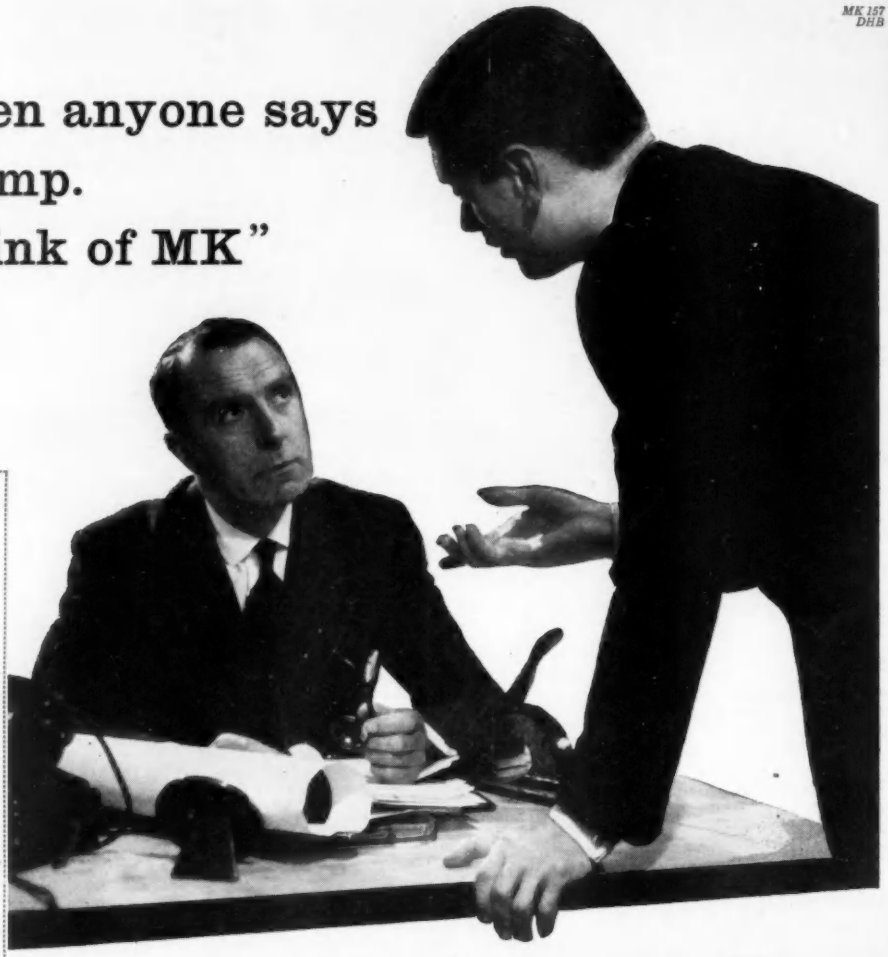

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15 AUGUST
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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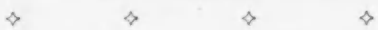

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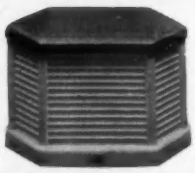

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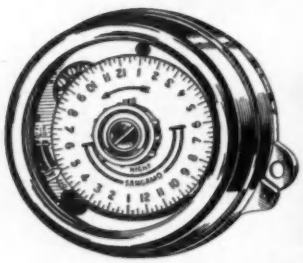

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ELECTRICAL REVIEW

15 August 1958 Vol. 163 No. 7 Established 1872

Professional Engineers' Conditions

THE purpose of the Engineers' Guild is " to promote and maintain the unity, public usefulness, honour and interests of the engineering profession." The interests of the profession must embrace conditions of service and remuneration, but in seeking to establish satisfactory standards the Guild is in a difficult position. Its membership covers chartered civil, electrical and mechanical engineers, who are engaged in many industries in a great variety of occupations impossible to classify in a few distinct categories. Any form of " collective bargaining " on behalf of professional engineers alone seems to be out of the question.

At present where these engineers are employed in organisations which have arrangements for collective bargaining at various levels they are represented either by a trade union or an association of which other than professional engineers may be members.

Hitherto it has been the Guild's policy to accept the principle of " general " collective bargaining, hoping " to achieve sufficient strength of membership to influence the activities of the staff side of joint negotiating committees in so far as matters of professional concern are involved." Now it is considered that while there are sound arguments in favour of collective bargaining through large trade unions, from a professional engineer's point of view there are strong disadvantages. Broadly these are due to the special position of the professional engineer in relation to his employers. He is usually in some kind of managerial position, although still an employee, and cannot easily conform to trade union practices.

The Guild has been forced to conclude that so long as the existing pattern of negotiating machinery remains, there is no prospect that the interests of professional engineers can be effectively protected in the fields to which it applies, and the dangers avoided by parallel action outside such machinery. But there are also fields in which such machinery does not exist and professional engineers have been able to secure conditions at least equal to those to be found in most branches of public service. Judging by American and Canadian experience, it seems possible to establish satisfactory relationships with employers which will guarantee both equitable treatment and preservation of professional status.

The Guild aims at attaining a position in which its representative character and knowledge of conditions will secure for it acceptance as the recognised consultant to engineers and their employers on the interests of the profession. It will also seek

legislation to enable professional engineers to withdraw as a group from collective bargaining machinery in any particular field if the majority are in favour of such a course. Recognising that there is no immediate prospect of such legislation, the Guild will in the meantime continue to endeavour to increase its membership to a point at which it can influence joint negotiating committees in matters of professional concern. Although this appears to be quite a laudable object it is not easy to see how there can really be any significant distinction between professional engineers and others in similar jobs when bargaining is collective.

ELECTRICITY SUPPLY ASSOCIATIONS

The questions raised by the Engineers' Guild are of particular concern to engineers in the electricity supply industry. Here the strongest staff organisation is the Electrical Power Engineers' Association, a trade union whose membership includes many chartered electrical engineers. No doubt these members, although in a minority, have exercised some influence in collective negotiations and thus may be said to have helped to maintain the standing of professional engineers. Nevertheless the Association is mainly composed of men who would not be regarded by the Guild as professional engineers and therefore not properly qualified to represent them.

At a higher level in the industry there is the Association of Managerial Electrical Executive, which consists to a much greater extent of chartered electrical engineers. In its origin this organisation was virtually an association of professional (municipal) electrical engineers who were as a rule managers of their undertakings. Upon nationalisation there was a certain separation of functions and membership of the A.M.E.E. now includes managers who are not engineers. Presumably this body, too, would not be looked upon by the Guild as an entirely suitable organisation to represent professional engineers.

GAS-TURBINE STANDBY PLANT

The application of gas turbines to electric power generation would seem to be limited to peak load and standby duties mainly because of the cost of the fuel. One of the best examples of their use as standby plant in this country is described in this issue. Although the overall thermal efficiency of the three gas turbines at Ashford Common Works is only about 16 per cent this, as well as the fuel cost, is of secondary importance due to the limited operating periods of the plant. The first consideration is the efficiency of the whole works of which the standby plant forms only a small part.

For standby and peak load plant, the capital cost is the major item in considering generating costs. At the present time the capital cost of a gas turbine is about the same as that of a steam turbine. Another requirement, which is more important for standby than peak load plant, is that the set should be capable of being brought up to full load as quickly as possible and that is where the gas turbine scores.

Open-cycle gas turbines do not require cooling water and their size and weight for a given power output is smaller than for other prime movers. This simplifies many problems associated with their siting. So far gas turbines have only been used to a limited extent in this country for electric power production and the Metropolitan Water Board is to be congratulated on its decision to use this type of plant. It is confidently expected that more gas turbines will be installed for standby and peak-load duties.

"ELECTRICAL WHO'S WHO"

The fifth edition of the "Electrical Who's Who" is now available. Its nearly 8,000 entries cover all branches of the electrical industry and profession. Copies are obtainable at 27s 6d (postage 1s 6d) from Electrical Review Publications, Ltd., Dorset House, Stamford Street, S.E.1, or booksellers

ACCIDENTS IN THE HOME

It is always a sad task to read the annual summary of fatal electrical accidents prepared by the Home Office. Last year 66 people died as a result of shocks from electrical domestic appliances and installations, and it is clear from a study of the causes that most of the accidents could easily have been avoided. A substantial reduction could surely be achieved if there was a greater awareness of the dangers involved in the use of electricity and if certain simple rules were followed. Most of the accidents resulted from appliances that were not properly connected or earthed; from portable appliances used in bathrooms or when damaged; from working on live circuits; and from wiring carried out by "amateurs." It is to manufacturers' credit that few accidents were caused by faulty appliances.

Although deaths from electric shock are few compared with the total number of fatal accidents in the home (61 out of nearly 8,000 in 1956), they are still too frequent. What can be done? Two suggestions are that manufacturers and retailers should make greater efforts to point out the importance of ensuring that appliances are properly connected; and Electricity Boards might consider placing a notice near the meter drawing attention to the danger of making unauthorised alterations and extensions to the wiring.

LESS COAL FROM NEWCASTLE

The Central Electricity Generating Board had about fifty colliers in commission, engaged mainly in the transport of coal from north-eastern ports to the South of England. Recently six of them have been sold and three others are being broken up and, it is reported, during the next ten years about another dozen will be disposed of.

This is a reflection of electricity supply policy. The majority of the nuclear power stations now under construction or projected will be sited in the south, rendering that region less dependent on coal. The use of oil firing is given as another influence, although in its 1956-57 report the Central Electricity Authority recorded a slowing down of coal to oil conversion. Moreover the coal supply situation is now regarded as more hopeful than it seemed to be a year or two ago.

General view of the Ashford Common Works. The east-west centre block contains the control room and switchgear

PUMPING STATION PLANT

GAS TURBINES AT ASHFORD COMMON WATER WORKS

Three open-cycle gas turbines are employed at Ashford Common Works as standby plant. These supply the generator bars of a 33 kV duplicate busbar arrangement with the switchgear arranged back-to-back. Practically the whole of the plant in the pumping station can be remotely operated from the control room

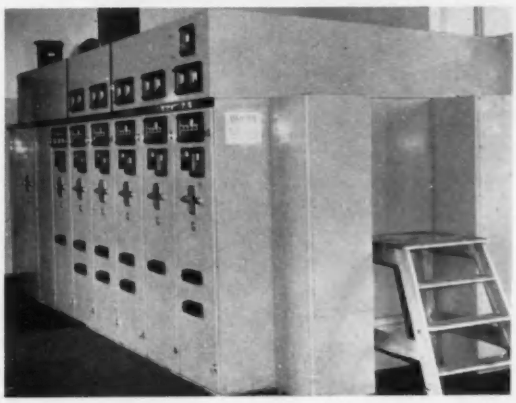
THE Ashford Common Works forms a major part of the Metropolitan Water Board's post-war programme of development and probably constitutes the largest complete filtration station and pumping plant ever constructed at one time in Europe. The scheme, which is now nearly complete, will have cost over £5 million. As reported in our last issue, the official opening of the works at Sunbury-on-Thames, Middlesex, was performed by Mr. R. J. Buckingham, the chairman of the Board, on 31st July.

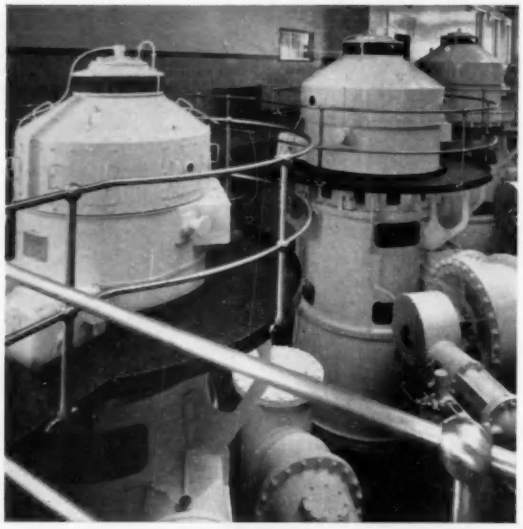
The new works, which have a capacity of 90 million gallons of water a day, occupies a site of about 125 acres immediately to the east of the existing Queen Mary storage reservoir. The main purpose is to provide additional filtered water to cope with future developments and to pump water from the Queen Mary and Staines reservoirs to the filters at Kempton Park and Hampton as well as the new filters at Ashford.

Raw water will normally be received from the Queen Mary reservoir through a tunnel of 100in diameter. At the filtration plant, the water passes through two 54in diameter valves which automatically control the flow. The first stage in the purification process consists of aeration. The water is cascaded in two 90ft diameter aeration basins, each with a 45 million gallon per day capacity. This improves the quality of the water and removes the taste and odour by increasing the oxygen content.

The water then passes to the micro-strainers. This installation consists of 24 strainers, each 10ft in diameter and 10ft long. The strainers are large cylindrical cages covered with a fine mesh having approximately 80,000 apertures per sq in. The water enters the cylinder at one end and passes through the mesh into the compartment outside, the cylinder rotating continuously about its axis. At the top of the cylinder small water jets play

3·3 kV switchgear. The two projections at the side cover the duplicate busbars. The circuit-breakers are arranged back-to-back on each side of the busbars





Laurence, Scott variable speed n-s motors driving Harland pumps

on the mesh from the outside and wash the algae and other matter into a trough inside the cylinder, the dirty water being carried away through the hollow shaft upon which the strainer is rotating.

From the micro-strainers the water passes to the open slow sand beds. These beds, of which there are 32 in all, measure about ¾ acre each, the dimensions being the same to enable mechanical methods of sand handling and washing to be adopted. The strained water enters at one end through a baffled inlet chamber from which it flows slowly on to the bed. It passes down through the sand and gravel to the under-drains and is collected into two 66in diameter mains which convey it to the chemical treatment plant.

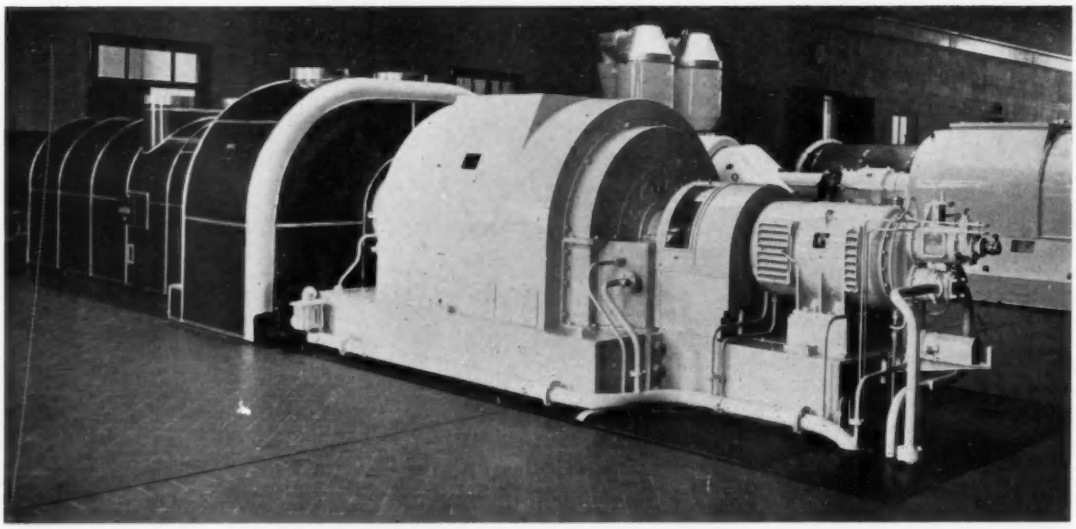
When a bed becomes choked by the film of micro-organisms which collects on the surface of the sand, it is laid off to be cleaned. Provision has been made for two kinds of mechanical cleaning. One method is to use a hydraulic sand-washing machine carried on a bridge or gantry travelling on rail tracks between the beds. The apparatus cleans the sand without removing it from, or emptying, the bed. The other method employs a travelling sand-handling bridge for use when re-sanding the beds.

To complete the purification of the water, it is treated with chlorine after filtration, the apparatus embodying all the latest features of automatic control to cope with changes in quality as well as quantity. Retention of the water in the contact tanks ensures the complete action of the chlorine before the water is pumped into supply.

Pumping Station

The pumping station is divided into three main areas with the generating plant in the northern section, the control room on the first floor of the centre block and the pumping plant in the southern section. On the second floor of the centre block, the whole east-west length of the building is occupied by the 3·3 kV duplicate busbar switchgear. Cable space is provided between the first and second floors, i.e. between switchgear and control room, and also between the first and ground floors.

The 22 kV incoming supply from the Southern Electricity Board is connected to three 6 MVA, 22/3·3/0·415 kV transformers housed in a separate building. Each transformer is connected to one of the three sections of the air-insulated 3·3 kV duplicate busbars in the pumping station. Normally, one set of busbars is supplied by the main transformers and the other set by the generating plant in the pumping station. One of the three diesel generating sets and one of the three gas-turbine generating sets are connected to each section of the busbars. The busbars are sectionalised to allow flexibility in operation. On-load transfer for the larger pumps is provided to allow the Metropolitan Water Board's generating plant to reduce the maximum demand.



Brush two-in-line shaft gas turbine driving a 2,500 kW alternator

The main 3·3 kV switchboard consists of forty-two 150 MVA, vertically isolated oil circuit-breakers arranged back-to-back on each side of the duplicate busbars. High-lift pumps are provided with two circuit-breakers, each breaker being permanently connected to a different set of busbars. Both circuit-breakers are separately cabled to the pump which they control. On-load transfer entails both breakers being closed at the same time for a few seconds thus paralleling the S.E.B.'s supply and the M.W.B.'s generators. Synchronising equipment is provided in the control room.

Distribution

All main pumps in the pumping station are operated at 3·3 kV. The 415 V station auxiliary switchboard is fed by two 200 kVA, 3,300/415 V transformers and a 3·3 kV ring main supplies four similar transformers at various points in the works. These supply the micro-strainer house, contact tanks, chemical treatment houses, etc. The station auxiliary board can also be fed from the 415 V tertiary windings of the main transformers via reactors to reduce the fault level to 25 MVA. The two alternative feeds to this board are interlocked to prevent interconnection as their vector references are not the same. The station 415 V auxiliary board consists of circuit-breakers for incoming supplies and fuse-switchgear for the outgoing circuits.

Gas Turbines

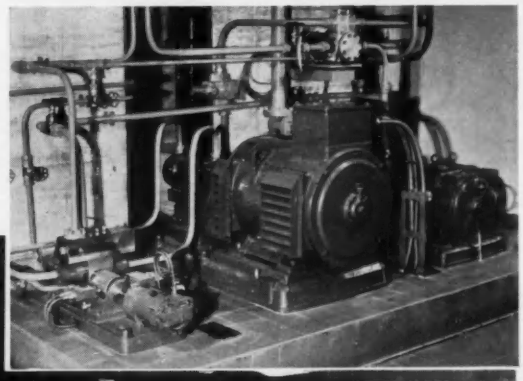
The 100 per cent standby plant consists of three gas turbines driving alternators generating at 3·3 kV. Two sets are of 2,500 kW and one of 2,250 kW capacity. The pumping station also contains three 1,100 kW, 3·3 kV diesel generating sets which are intended to reduce the maximum demand during peak-load periods.

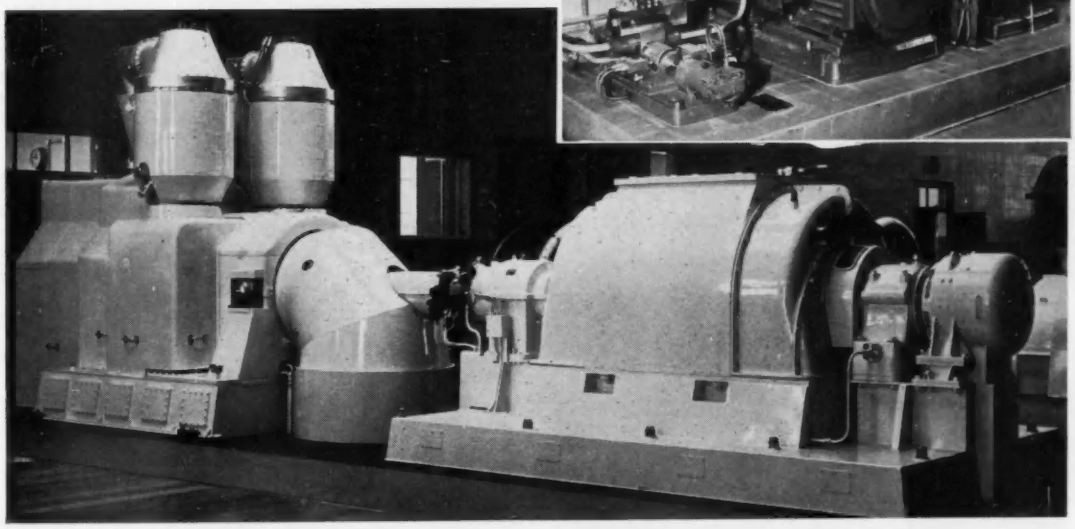
Gas turbines were selected for the standby plant owing to their quick-starting characteristics and their high power output with small size at low load factor. In this application, the thermal efficiency of standby plant was not the first consideration, the emphasis being on the overall efficiency of the pumping station. The sets, which were supplied by three different manufacturers, are of the simple open-cycle type operating at about 16 per cent overall thermal efficiency. The Brush set has a.c. driven auxiliaries, except for a d.c. starting motor. All auxiliaries of the English Electric set are d.c. operated so that this set can be started if there is a complete power failure. The auxiliaries of the Metropolitan-Vickers set are all a.c. operated.

In the open-cycle gas turbine system, air is drawn into the compressor at atmospheric temperature and pressure and compressed to about 70 p.s.i., with a consequent temperature rise to about 450 deg F. Fuel is injected into the air stream and constant pressure combustion takes place in the combustion chamber giving an outlet temperature of about 1,400 deg F. The hot gases then pass through the turbine and, in the case of the open cycle, exhaust to atmosphere at about 900 deg F. In a closed-cycle system the exhaust gases are used to preheat the air before combustion.

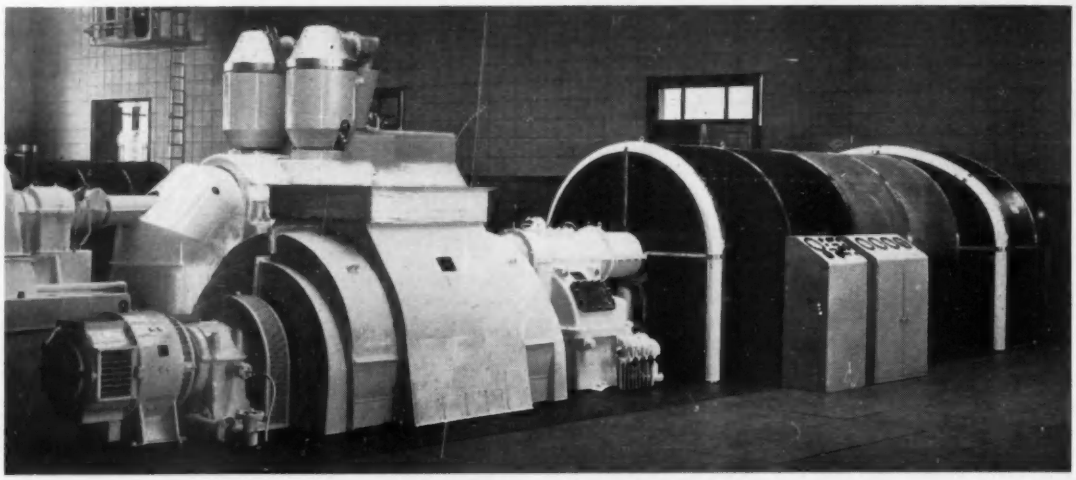
Combustion in a gas turbine takes place at approximately constant pressure, provided stable running of the machine has been reached. If the machine could be stopped dead, the pressure in the combustion chamber would rise very rapidly. When running, the pressure increase due to combustion is, in fact, immediately dissipated in the turbine with a volumetric expansion. To start a gas turbine, the unit is first run up to some fraction of full speed by a starting motor and the fuel is then admitted to the combustion chambers and ignited. The English Electric machine uses propane gas as the igniter and the other two machines use a spark gap. Starting of the turbine normally takes about five to ten minutes.

Starting equipment for the English Electric turbine. Left to right: hydraulic starting sequence motor, d.c. motor and fuel pump





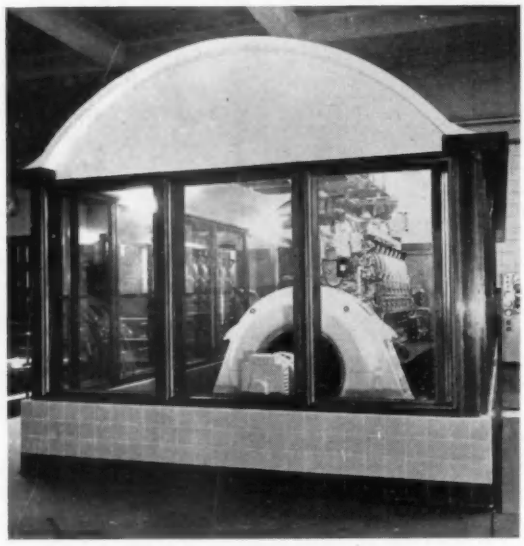
English Electric 2,250 kW gas turbine. The two combustion chambers can be seen above the turbine



Metropolitan-Vickers 2,500 kW single-shaft gas turbine set

The Brush turbine is a two-in-line shaft set; one shaft carries the two stages of the h.p. turbine blading and the 14-stage axial flow compressor, driven at 6,375 r.p.m. The other shaft carries the two stages of the l.p. blading and drives the alternator directly at 3,000 r.p.m. Air leaves the compressor at 60 p.s.i.a. and fuel oil is injected into ten separate combustion chambers parallel to the main shaft. The h.p. and l.p. turbines are of the disc type and the gases impinge on the h.p. turbine blade roots at 1,220 deg F. The gases leave the h.p. turbine and enter the l.p. turbine at 1,050 deg F and pass to exhaust at 890 deg F. Governing is effected by regulation of the spill valves on the combustion chamber burners, which alter the amount of fuel admitted to the chambers. Fuel is supplied at constant pressure and any excess not required for combustion is spilled back via control valves to the fuel pump inlet. Starting, stopping and speed variation are carried out from the control room panel. At the full load of 2,500 kW, 330 gallons of fuel is consumed per hour.

One of the General Motors oil engines driving a G.E.C. 1,100 kW alternator. Double-glazed soundproofing is employed



The English Electric machine is also a two-in-line shaft set. It comprises a six-stage axial and single-stage centrifugal compressor driven by a two-stage h.p. axial "charging" turbine at 8,250 r.p.m. on one shaft and a two-stage l.p. axial "power" turbine on the other shaft, running at 7,000 r.p.m., driving the alternator via an epicyclic gearbox at 3,000 r.p.m. The compressed air at 70 p.s.i.a. is ducted in two equal streams into the twin combustion chambers. Diesel fuel oil is introduced by means of a single burner carried on the top cap of each combustion chamber. The h.p. and l.p. turbines are of the single-disc type. The turbine inlet temperature is 1,430 deg F and the exhaust temperature is 915 deg F with the h.p. turbine outlet temperature at about 1,100 deg F. Governing is effected by the regulation of the flow to and from the spill type burners. Starting, stopping and speed variation are effected from the control room panel. For starting, a vane-type hydraulic motor is fed with high-pressure lubricating oil by a d.c. motor driven pump. When the compressor shaft reaches a given speed, the automatic starting sequence brings the igniters into operation and then turns on the main fuel supply. The hydraulic starting system cuts out at 3,300 r.p.m. and the turbine accelerates under its own power until the power turbine reaches the governed speed of 7,000 r.p.m. A 400 Ah Nife battery is used for starting.

The Metropolitan-Vickers unit, which was commissioned 18 months ago, is a single-shaft set running at 7,000 r.p.m.; it has a 14-stage axial flow compressor and four stages of turbine blades. The alternator is connected to the turbine by a single-helical, single-reduction gearbox giving a speed of 1,500 r.p.m. Air leaves the compressor at 75 p.s.i.a. and 470 deg F. The fuel oil is atomised and ignited in six combustion chambers. The temperature of the gases entering the turbine is about 1,300 deg F and the exhaust temperature is about 720 deg F. The unit is governed by the fuel supply to the combustion chambers by various valves before the burners, with no spill control on the burners themselves. Starting, stopping and speed variation are effected from the control room panel. When starting, the barring motor rotates the set slowly. The starter motor then

takes over and increases the speed to 3,000 r.p.m. when the unit becomes stable and the starter motor cuts out.

The three gas turbines each have a 1,250 gal fuel oil service tank on the first floor.

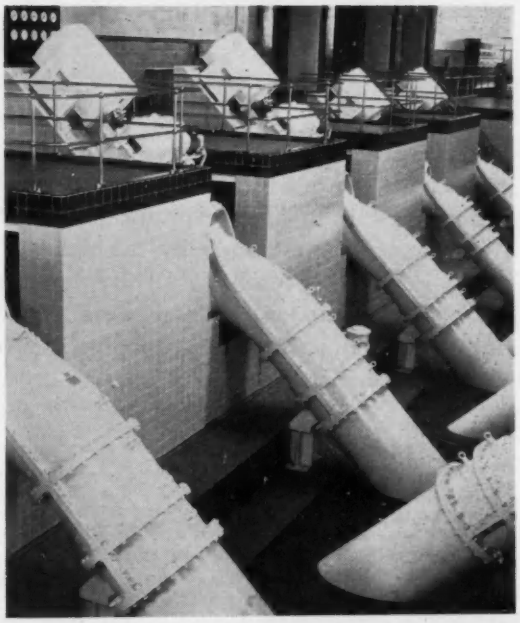
Owing to the extended delivery period which British firms offered in 1947, the Board purchased General Motors two-stroke oil engines. These 16-cylinder supercharged V-type engines are capable of delivering 1,750 b.h.p. at 750 r.p.m. The Board also purchased 1,400 kVA, 3·3 kV alternators for these engines from the General Electric Co., Ltd. Starting is effected by compressed air at 600 p.s.i. and the engines are arranged for starting from the generator floor. Once running they are controlled and stopped from the control room. Because of the high noise level (101 dB), the oil engines are enclosed in double-glazed cubicles.

The electrically driven high-lift pumps are used for supplying 90 million gallons per day of filtered water to London. The total horse-power of this plant is 12,232 with a capacity of 244 m.g.d. Auto-transformer Korndorfer starters are employed for these motors. The low-lift pumps are installed for pumping stored water to the Ashford Common filters, or to those at the Board's Kempton Park and Hampton works. The capacity of this plant is 300 m.g.d. with a total horse-power of 1,927.

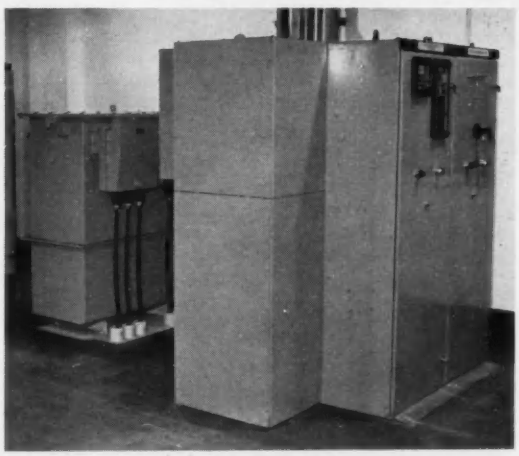
Control Room

Virtually the whole of the plant can be remotely controlled from the control room situated centrally on the first floor. The control desks for each pumping unit are arranged on one side of the control room and, from double-glazed windows, the pumps on the ground floor in the southern section of the pumping station can be seen. The generators on the ground can also be observed from the other side of the control room. The control desks for the gas-turbine and oil-engine alternators, and the electric control for the pumps are arranged on this side of the control room under the windows. The main and auxiliary transformers and switchgear are controlled from a desk at one of the end walls. Each set of control desks in the control room incorporates mimic diagrams. All high voltage switches and electrically-operated sluice valves are represented by automatically-operated semaphores.

The principal contractors are:—Civil engineering and building works, John Mowlem & Co., Ltd.; high-lift pumps, motors and "Rotovalves," Harland Engineering Co., Ltd.; low-lift pumps, Vickers-Armstrongs (Engineers), Ltd.; low-lift motors, Metropolitan-Vickers Electrical Co., Ltd., Laurence, Scott & Electromotors, Ltd., and Electric Construction Co., Ltd.; gas turbines, Metropolitan-Vickers Electrical Co., Ltd., English Electric Co., Ltd., and Brush Electrical Engineering Co., Ltd.; oil-engine alternators, General Electric Co., Ltd.; switch and control gear, Brush Electrical Engineering Co., Ltd.; cables and wiring, George E. Taylor & Co. (London), Ltd.; and transformers, Ferranti, Ltd.



View of low-lift pumps



Korndorfer auto-transformer pump starter, with auto-transformer on left. The cubicle contains the short-circuiting breaker on the left and the neutral point breaker on the right

Control room. The main electrical control panel is at the left with the three gas turbine panels in the centre. The oil-engine alternators are controlled from the panel to the right of the gas turbine panels. The hydraulic wall diagram can be seen on the right-hand end wall

Fault Path Impedance Measurements

The author discusses the Wiring Regulations of the I.E.E. with reference to measurement of protection afforded to an installation under fault conditions. A simple and reliable test set is described which appears to have advantages over existing instruments. The measurements made by the test set go further than those called for in the present I.E.E. Regulations but are nevertheless realistic and the author considers that there should be some change to encourage the adoption of this type of testing

TESTS ON L.V. SYSTEMS ON CONSUMERS' PREMISES

*By A. J. BAGGOTT, M.I.E.E.**

THE most common method of protecting a consumer's installation is by means of a fuse, and providing considerations of the peak current available and the fuse characteristics are given due weight, the protection is adequate. When an earth fault occurs on a consumer's installation the consumer's earth electrode and any apparatus connected to it is raised in potential in proportion to the impedance of the combined earth circuits that exist. These may include the neutral of the supply system and so the responsibility for the earth path is divided, but it is firmly in the consumer's interest that under fault conditions the voltage rise, which is in proportion to the impedance of the whole earth path, is limited. If the impedance of the combined earth path is high a condition may exist where the fault current is insufficiently high to clear the fuse and a condition of danger may exist.

The Institution of Electrical Engineers' interpretation of the problem is made clear in the 13th edition of the Wiring Regulations. The basic requirement is that on the occurrence of a fault a current shall flow corresponding to at least three times the rating of the fuse, or alternatively, where a circuit-breaker is employed a current of at least one-and-a-half times the overload setting. In addition to this, they consider it advisable that the maximum sustained voltage developed on the consumer's earth should never exceed 40 V.

To limit the rise in earth potential under fault conditions to this figure the impedance of the whole earth circuit needs to be related to the available fault current. For example, if at least 60 A is required to clear a typical domestic fault then the permitted impedance ceiling is 0·67 ohm, and for currents of 100 A and 300 A the ceiling impedances are 0·4 and 0·13 ohm. These figures are not usually obtainable in practice and it is suggested that if the combined earth circuit is to be considered the permitted maximum of 40 V should be raised.

The I.E.E. make the additional recommendation that in circumstances where the earth impedance is high, earth leakage circuit-breakers should be employed. To assist in the choice of the type of protection to be employed means for measuring the effectiveness of an earth path are given and a particular recommendation is made that a test set shall be employed which will measure the impedance of the earth loop circuit including the neutral. These sets are appropriately called earth loop impedance test sets. The suggestion is made that the instrument employed should be so designed to permit a current to flow in the loop circuit of one-and-a-half times the rating of the sub-circuit provided that in no instance need it exceed 25 A, the ratio of voltage/current, where the voltage is the injected voltage and the current that flowing during the test, to be taken to give a figure which is reasonably in proportion to the earth loop impedance.

Instruments for Earth Loop Testing

Many test sets are available for measuring earth impedance and/or resistance and those in common use include the current injection type. The various designs range from the simple basic design quoted in the 13th edition of the I.E.E. Regulations to the more complicated compensated types, one of which was described in the *Electrical Review* of 17th February, 1956. Each instrument produces a reading which is reasonably accurate within the limits of the test applied and in any case it is suggested that the accuracy is high when one considers the arbitrary limits recommended for adoption in the Wiring Regulations. The current used is normally from 3 A to 25 A and several have the additional facility for taking other measurements such as voltage or leakage. The more advanced sets have compensation networks to accommodate the earth to neutral voltage which exists in more or less degree and, notwithstanding the varying amplitude and phase of this voltage, permit an accurate reading to be made.

Direct current sets of the "Megger" type have long been available for measuring resistance of a limited earth path, and more recently a set has been developed which makes a measurement of the earth loop path. This modified d.c. instrument uses a commutator so that the current generated, and the instrument connections, can be reversed regularly by which means any standing voltage between neutral and earth is ignored. The current available from this type of set is very limited, and its design permits a reading of resistance only. It is not considered to comply with the recent requirements of the Institution.

Shortcomings of Earth Loop Sets

Notwithstanding that the 13th edition of the I.E.E. Regulations requires that measurements be made on the earth loop circuit, it is fundamental that the earth fault path during actual fault conditions is not identical with this circuit. This will be seen clearly from Fig. 1 which shows the secondary winding of the supply authority's

* London Electricity Board.

transformer connected by means of cables to the consumer's control gear and load. The substation earth and the consumer's earth are illustrated. The phase/earth loop and the neutral/earth loop are shown and also two possible fault conditions, viz. a fault between the load side of the consumer's control gear and the neutral; and a fault between the load side of the consumer's gear and earth. Under each of these conditions the fault current which can flow is limited by the impedance shown as " Z " and the self and earth impedance of the supplying system.

When a fault to earth occurs the fault current path includes the phase conductor, the consumer's earth wire, the consumer's earth, the earth path between the consumer's earth and the substation earth, the substation earth and the secondary winding of the supply transformer. If an impedance measurement is made using a loop tester the injected current flows through the neutral conductor instead of the line conductor, and ignores the secondary winding of the supply transformer and the likely possibility of distributed earthing.

It can be argued that the requirements of the Institution are unreasonable inasmuch as they demand a complicated design to measure a circuit which is not used under fault conditions, and further, that if a measurement of an unrealistic circuit is to be adopted, then a rough and ready means of making the measurement should be permitted.

One approach to this problem is to investigate the impedance of the actual fault circuit, and to do so under fault current conditions, making at the same time an accurate measurement of the impedance of that circuit, or, alternatively, the fault current that can flow. One test set on the market at the present time measures within broad limits the phase-to-earth loop impedance in terms of availability of current to blow various sizes of fuse. The set permits fault current, limited by selectable preset resistors, to flow from phase to earth for a limited time and is then released by means of duplicated miniature circuit-breakers. When the circuit is made, the shunt coils of the circuit-breakers are energised by means of an auxiliary relay, and the fault is cleared in approximately 1½ cycles. To assess the value of fault current flowing during the test the voltage developed across a resistor included in the fault circuit is compared with a known voltage. A cold cathode thyratron, whose grid voltage characteristics are known, is employed to make the measurement and give an indication within broad limits of current amplitude.

The use of duplicated components reduces the risk of failures and no doubt gives protection to the operator of the test set, but danger is thought to exist when the earth impedance is of a high order and the general mass of the consumer's earth rises in potential. Although this happens for a limited period of some 30 millisec, this length of time is sufficient to damage human tissues if they are in contact with this voltage.

No control is exercised by the test set regarding the precise point of the sine wave at which the current is drawn and this chance measurement is not considered completely satisfactory. Statistical investigations involving at least twenty operations could be made to ensure that correct readings were obtained, but, basically, the method is considered to be of the " go " or " not go " type and is not a measurement in the strictest sense.

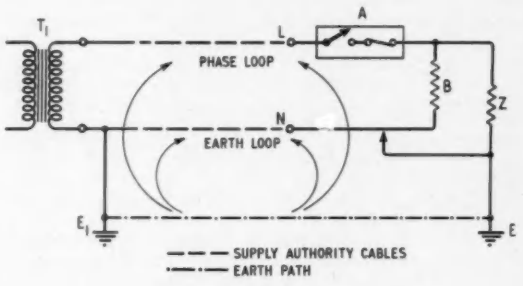


Fig. I

Phase to Earth Fault Tester

The basic requirement for a preferred type of test set is that fault conditions identical with those which arise under service conditions should be reproducible by means of the test set. It should be possible to apply these fault conditions repetitively and at a controlled rate in order to give an opportunity for considered measurements of current and/or impedance to be made. The fault applied should be at precise and predetermined points on the voltage wave and be applied for very short durations of time in order to avoid danger to the operator. Finally, the set should fail to safety.

Electronic Impedance and Fault Current Tester

A test set which appears to satisfy all the above basic requirements has been developed, but not yet adopted, by the London Electricity Board. It consists essentially of a simple electronic arrangement whereby short circuits

The complete electronic impedance and fault current test set and (below) back of panel view of the instrument

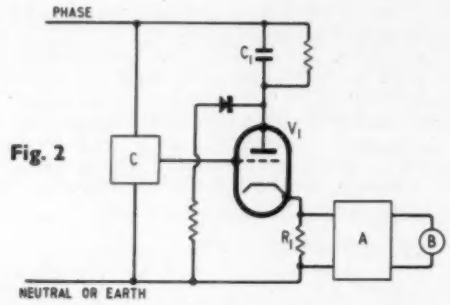


Fig. 2

are applied regularly and repetitively to the supply system from the consumer's premises. The set is designed to operate at precise instants of time so that fault currents are taken at predetermined points on the alternating voltage wave and it permits measurements to be made of the resultant current.

The measurement gives the effective phase-to-earth loop impedance and the method used appears to overcome the difficulties and disadvantages inherent in the test sets previously designed, both of the injection type and the electromagnetic short-circuit pattern.

The basic circuit (Patent 18666/57) comprises a gas-filled discharge tube (V1), capable of carrying heavy currents, which is ionised at regular intervals at precise points on the voltage wave. The instant of ionisation is determined by a circuit arrangement which employs cold cathode tubes whose control grids are connected to the alternating voltage of the system under test, and provide triggering voltages at predetermined times.

Fig. 2 shows the live side of the consumer's terminals connected via a shunted condenser to the anode of a gas-filled tube (V1), the cathode of which is connected via a current-limiting resistor to the neutral or earth. This circuit is capable of passing a heavy current determined solely by the impedance of the circuit, the capacity of the condenser and the state of ionisation of the tube. At predetermined points on the voltage wave a triggering voltage is supplied to the grid of V1 and ionisation takes place. A heavy current flows for a limited time determined by the time constant of the circuit which is selected to avoid heat generation in the circuit and the operation of any protective devices that may exist. The current can be adjusted to between 50 A and 500 A with a pulse length of approximately 100 μsec.

The anode condenser is shunted by a resistor in parallel with a circuit which includes a rectifier and resistor in series with the supply source. The arrangement is such that after each current pulse the condenser is rapidly discharged to condition it to receive the next current pulse. The resistor-rectifier combination allows the condenser to discharge via the internal mains network, and on a negative half-cycle the condenser accepts a charge in a reverse direction. This arrangement gives protection to the tube and also ensures that the state of the condenser is such that the next pulse can be taken after a short interval, and further that the largest possible current swing is available. The time constant of the whole system is so arranged that current pulses can be taken on each positive half-cycle regularly and precisely at a given point on the positive half-wave; this results in a repetitive current waveform which develops a voltage across the resistor (R1). This waveform has a frequency which is identical with the fundamental.

The method of triggering V1 is by means of a cold cathode thyratron which is driven from the alternating supply voltage and is so arranged that ionisation takes place at a precise point on each positive half-cycle. The actual point on the alternating wave at which the full current is drawn from the supply system is tightly controlled by a network connected to the grid of the thyratron. It is arranged that, irrespective of the supply voltage, the current pulses are taken at precise points on the positive half-wave, the result of which is that the test set ignores varying mains voltages.

The voltage developed across the resistor is proportional to the peak current. This voltage can be compared with and measured against a steady and known voltage taken from the battery or similar source using a galvanometer as a null indicator. It follows that if V2 is the known voltage and V1 is the voltage developed across the resistor, then V2 becomes a measurement which is proportional to the amplitude of the peak current. From this figure the impedance Z of the circuit can be calculated from $Z=\frac{E}{I}$ where E is the peak mains voltage and I the amplitude of the pulse current. The voltage V2 can be conveniently measured by normal voltmeter technique or by means of a calibrated potentiometer connected to a stable and known d.c. source. More direct methods are used in practice and consist, as shown, of an integrating network which takes into account waveform and frequency errors which may arise when measurements other than open circuit voltage are taken.

The instrument, which is illustrated on page 281, is calibrated to read directly either in terms of current or ohms and includes a scale-shaping network which permits readings between 0·1 ohm to occupy some 50 per cent of the scale length.

It may be preferable in some circumstances to draw current from the mains at less frequent intervals, and this can be simply achieved by means of a frequency reduction circuit using cold cathode tubes which are connected between the triggering thyratron and the V1.

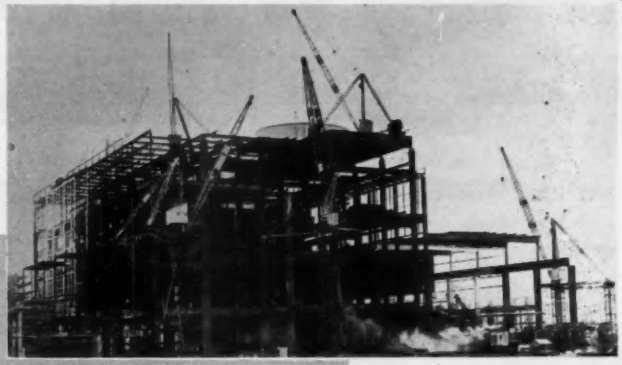
Accidents in the Home

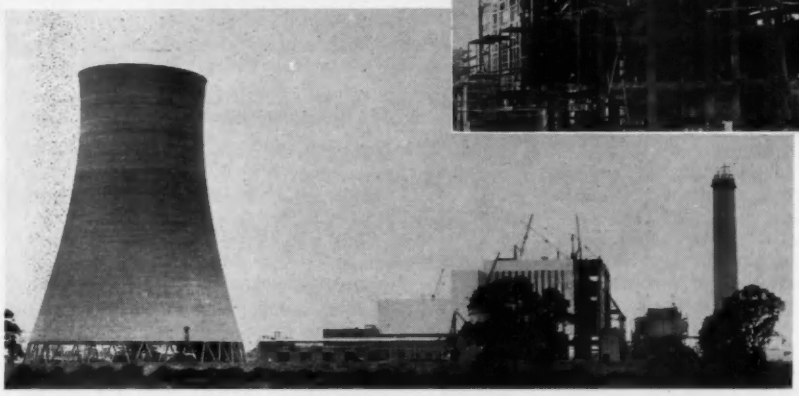
SIXTY-SIX fatal domestic electrical accidents were notified to the Home Office during 1957. This compares with 41 in 1956 and 61 in 1955.

A summary of the appliances and accessories involved in the accidents, prepared by Mr. S. J. Emerson, H.M. Electrical Adviser to the Home Office, shows that heaters and fires (two in bathrooms) accounted for 12; cables and flexibles, 8; radio, T.V. and gramophone sets and aerials (three in bathrooms), 5; washing machines, 4; irons (one in bathroom), 4; portable lamps (five in bathrooms), 7; plugs, sockets, adaptors, etc., 5; plugs, sockets or connectors for electric kettles, 6; electric blankets, 1; vacuum cleaners, 2; electric drills, 3; and refrigerators, 1. Two further accidents (one in bathroom) are classified as miscellaneous and six occurred on "miscellaneous domestic premises."

A précis of the causes of the accidents shows that most were due not to faulty appliances but to their misuse, and to "human errors and mental aberration on the part of the user." In particular, the danger of taking portable lamps and radio equipment into the bathroom was again made evident. A number of fatalities were caused by amateurs incorrectly connecting up appliances and making unauthorised extensions to the system. Where internal faults in appliances had occurred, the fatality usually resulted from the appliances not being properly earthed. A prime or contributory cause of a number of accidents was the fact that the appliances concerned were controlled by a single-pole switch connected in the neutral conductor. Many people still attempt to carry out repairs on live circuits, and this accounted for the deaths involving the plugs and connectors of electric kettles.

HIGH MARNHAM POWER STATION





Already the new structure at High Marnham is a landmark in the area. Our illustrations, from recent photographs, show how the work on the station is progressing

PUBLICATION OF SPECIAL DRAWINGS

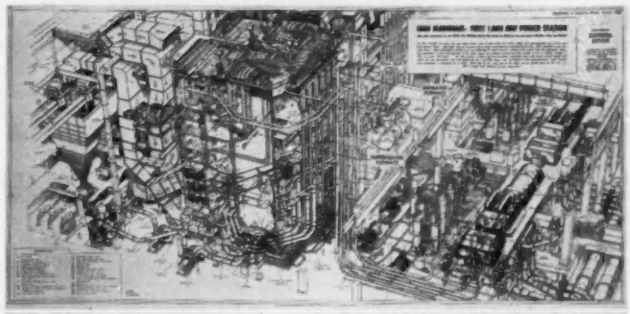
IT will probably not be necessary to remind our readers that in the *Electrical Review* of 19th October, 1956, and 26th April, 1957, we published special coloured drawings by our engineering artist showing, respectively, the new nuclear power station of the United Kingdom Atomic Energy Authority at Calder Hall and the Hunterston nuclear station of the South of Scotland Electricity Board. These graphical illustrations were produced with emphasis on the operational aspects. They created such outstanding interest that we decided to treat a "conventional" power station similarly and we chose one of the most modern at present in design and construction, namely, the new High Marnham station, on the River Trent near Newark, Notts., of the Central Electricity Generating Board.

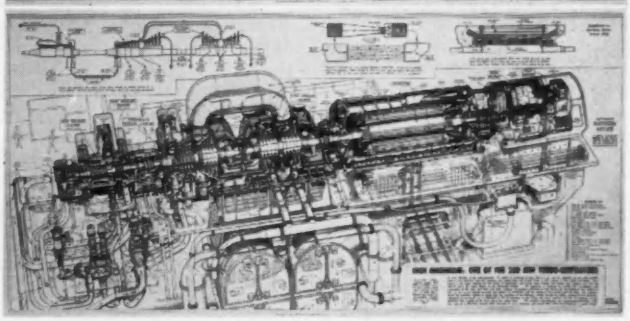
We have used the word "conventional" to distinguish it from the nuclear stations, but the High Marnham station, with its 200 MW boiler and turbo-alternator units and an overall capacity of 1,000 MW, is conventional only because its boilers are coal fired.

Work on the site began early in 1956 and it is expected that the station will commence to feed into the 275 kV grid in June next year.

It is our intention to publish an extended description of High Marnham in our next two issues, namely 22nd August and 29th August. The first will deal in the main with the constructional features of the station, while the second issue will be devoted to many of the operational aspects. Each section of the article will carry one of the special graphical drawings, 23in wide, in colour, as a supplement, and there will be other illustrations, including constructional photographs taken very recently on the site. These drawings are reproduced below on a reduced scale to give readers some idea of their nature.

We expect the interest created by these drawings to be even greater than that shown in the case of Calder Hall and Hunterston, and that is why we publish this advance information.





LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electricity Supply Load Factor

IN his article in the *Electrical Review* of 25th July Mr. D. Bellamy substantiated a point made in my letters of 15th and 29th November, 1957, namely, that consumer load factors are largely inherent and not influenced by the tariff structure. Many thousands of hours of discussion with production managers on the cost of electricity must have ended in the same way. Increasing the electrical load factor by either increasing the plant load factor, or alternatively chopping the peaks, will reduce the cost of electricity per unit of production, but there are far more telling reasons for doing the former, if possible, and the latter is certain to cost more than it will save. How many factories have demand alarms? In my experience not 2 per cent and the only effect of these is to create arguments with the supply authority on the accuracy of the latter's meters.

In my first letter I suggested that the 100 per cent load factor consumer was not such a desirable acquisition and in my opinion this is supported in the article by the statement of system optimum load factor at round about 70 per cent. (Another authority has recently put it at 60 per cent, but I would think Mr. Bellamy's figure nearer the mark.) If then the system load factor of some 50 per cent is largely inherent and the optimum is of the order of 70 per cent, can we not at least start to think in terms of a much simpler tariff structure retaining only the parameters of quantity buying and on/off peak characteristics? In the latter case, with some diffidence, I disagree with the contention that it would be inequitable to offer off-peak rates to consumers who are not also paying on-peak rates. Is it not true that the increased efficiency resulting from judicious off-peak development would redound to the benefit of all consumers? Any rate should, of course, cover all the charges incurred in retailing (with a small profit) and in this respect I suspect some off-peak rates are, in fact, " give away " prices.

What else can the industry do, besides increasing off-peak load, to improve the load factor still further? I think it will be accepted that any extended utilisation and increase in variety of consumers will tend to increase the system load factor, and an important matter influencing this extension is capital expenditure comprising cost of apparatus with its installation and cost of connection to the public supply. One may assume that manufacturers in their own interests are keeping the former to the minimum consistent with quality. With regard to the latter, I used to think it right that individual consumers should pay proportionately to their connection costs and that the general body of consumers should not " subsidise " them. Now I am not so sure. Does not my earlier reference to increased efficiency (alias increased utilisation) benefiting all consumers apply here?

To return to tariffs. Perhaps " flat rates " is too big a pill to swallow at the moment, but I do suggest that two steps indicated in my earlier letters can be taken immediately. These are to forget about rooms, floor area, rateable value, etc., in the case of the domestic tariff; and to cease offering alternative tariffs for general use. To me it is Gilbertian to leave it open to a consumer to pay alternative prices for the same commodity whatever tariff structure is used. With great deference to the pundits in these matters may I submit the following tariff structure as a first step towards complete simplification:—

1. A fixed block tariff with the follow-on rate based on the off-peak parameter for domestic consumers.

2. For the smaller commercial and industrial consumers a fixed block tariff grouped as follows:—

   (a) Single-phase (or 15 kVA) connection to the m.v. network.
   (b) Three-phase 45 kVA connection to the m.v. network.
   (c) Three-phase 100 kVA connection to the m.v. network.

3. An m.d. tariff for all supplies exceeding 100 kVA (usually transformer supplies). This tariff would, of course, be modified to suit the metering (h.v. or m.v.) and the m.d. kW charge would incorporate an off-peak feature, but I do not think that both annual and monthly m.d. tariffs are necessary.

4. An off-peak rate for specified loads available to (2) and (3).

With proper adjustment average prices would not vary from the present, and the variation either up or down for any individual consumer would not be large, but what would be large is the consumer goodwill arising from a system of charges which the average consumer can understand. And from this, I am sure, an increased utilisation would result.

Liverpool. G. H. CURRIE.

IN his excellent paper on " Load Factor in the Electricity Supply Industry " (*Electrical Review*, 25th July) Mr. D. Bellamy draws attention to the slogan " Large sales of units wipe out the effect of capital costs." He also goes on, quite properly, to stress the fact that some loads, notably the water heating load, possess predominantly " off-peak " characteristics and high diversity. Obviously, what the supply industry requires is high unit sales per kilowatt installed. In this connection there is a field which Mr. Bellamy overlooked, namely, electric central heating.

The electric fire is used only intermittently, usually for very short periods, and its contribution to the " peaks " may be considerable. It would be interesting to ascertain what is the average daily use of a 2 kW fire or convector. I venture to suggest it may only be an hour or so per day and that part of that time may coincide with the breakfast cooking, the morning ablutions and washing up, and thus the morning peak.

Electric central heating by low-temperature radiators, " tailored " to full window width under thermostatic control, has a comparatively low peak in relation to units used because of the diversity between thermostats and between rooms. It should be possible to so arrange the wiring and the thermostats of an all-electric house so that when the cooker or certain parts of the cooker are not in use, automatically the immersion heater and the electric central heating are " topped up." Assuming an available load of 4 kW when the cooker is not in use there would

be available 2 kW for the water heater and 2 kW for the heating circuit or, alternatively, 4 kW for the heating circuit, the radiators in such a case being controlled by a three-contact thermostat. Thus the supply authority on this particular 4 kW of maximum demand could have a theoretical load factor of the order of 75 per cent.

I am wondering if a progressive person like Mr. Bellamy could not devise a tariff suitable for the development of domestic loads with a specially high load factor of which this a reasonable example. Given the right sort of tariff, manufacturers might, with advantage to all concerned, help to popularise these " high load factor " units.

London, W.1. A. C. HAZEL,
Managing Director, Hurseal, Ltd.

The Case for the Trolley-bus

IT is regrettable to see in your issue of 1st August a report of the replies given by a Government speaker to questions asked in the House of Lords on the subject of electric traction making reference to the disadvantages of trolley-buses.

The so-called disadvantages of trolley-buses have so often been shown to be nothing but a figment of the imagination of motor-bus trained and like-minded persons that I would refer to a report appearing in *Passenger Transport* of 6th August on the transport accounts of three large local authority undertakings, from which it appears that the profits or surpluses of trolley-bus operation have been used to make up the losses on bus operation as follows:—

	Trolley-buses		Motor-buses	
		£		£
Belfast	Surplus	38,612	Deficit	25,447
Bradford	"	4,786	"	33,895
Derby	"	29,181	"	7,395

One would have thought these figures showed an important advantage of the trolley-bus.

Another fact not generally realised by the public is that trolley-buses contribute in most cases far more to the general rates fund (to the obvious advantage of local ratepayers) than do bus undertakings and, among their many other advantages, they do not fill town and city streets with noxious fumes and nerve-racking noise.

Stanmore, Middx. W. G. AKERMAN.

Inadequate Wiring Systems

THE system of domestic wiring proposed by Mr. B. Raynor in his letter which you published on 25th July, has surely been anticipated by at least one manufacturer.

New-Day sell an excellent outlet, comprising a 13 A B.S. 1363 socket and a pair of ordinary 2 A three-pin sockets combined as a unit, the two latter sockets being separately fused. A fused terminal is also provided. The complementary fitting is a twin 2 A three-pin socket.

This arrangement appears to meet all Mr. Raynor's requirements. I have no connection with New-Day except that of a satisfied customer.

Redbourn, Herts. G. O. THACKER.

I HAVE read with great interest the letter in your 1st August issue from Mr. J. A. C. Kendall, the chairman of the Accessories Section of B.E.A.M.A., on the launching of an Adequate Wiring Campaign with the object of convincing the user that the advantages of electrical living can only be achieved by an adequate wiring system.

A point which I feel should receive due emphasis in any such campaign is the need for reliability in the wiring installation. The enjoyment of adequate wiring in the home depends on a trouble-free installation. In other words, quality is as important as quantity.

It is to be hoped that the organisers of this campaign will see their way to advising users of electricity of the need for their more adequate installations to be carried out by a reputable electrical contractor as, for example, an approved contractor of the National Inspection Council for Electrical Installation Contracting.

London, W.C.2. W. G. S. THOMPSON,
Chief Executive and Secretary, N.I.C.E.I.C.

MAY I be permitted to reply briefly to Mr. H. C. Cooper's letter in your issue of 8th August? It is not disputed that the system in Mr. " B's " previous house with its " sockets galore " is an ideal one, but it cannot be accepted that it had hardly cost him any more to install. According to Mr. Cooper, the 7/·029in cable had been run round each room. As only two socket-outlets are permitted on a spur one can only assume that the ring was run round every wall of every room. Some ring! Moreover, in the type of house with solid floors which we are considering, it was somehow managed in such a manner that to provide an extra socket one had only to " connect one in." This is a performance I should very much like to witness.

No, it looks as though Mr. " B's " hypothetical installation is just another classic example of design without regard for practical problems, problems which must finally express themselves in terms of £ s d.

One cannot escape the fact that the present ring main system, although a beautiful engineering concept, is just not being used for the purpose for which it was conceived. Mr. E. J. H. Marshall states that the average bedroom or living room needs 8-12 sockets, yet with this system available for ten or more years Mr. Mackenzie Parkinson and B.E.A.M.A. must initiate an Adequate Wiring Campaign because houses are being built with only one socket per room. What is Mr. Cooper's explanation of this state of affairs?

Regarding the use of irons and kettles: irons loaded at over 2 A would be thermostatically controlled and impose an intermittent load. Investigation will probably show that just like other apparatus an intermittent rating well above the continuous figure could be safely established for domestic plugs and sockets and so allow the use of these and similar devices. To have to disconnect the fire to boil a kettle does not seem to me to be any great hardship.

Maidenhead, Berks. B. RAYNOR.

Smoking at Brussels

IN the article " Business from Brussels," published in your issue of 11th July (page 73), you complain about the fact that only about a tenth of the many thousands of people visiting the Exhibition include the British Pavilions in their tour.

Belgians, and I guess they are the majority of the visitors to the International and Universal Exhibition, don't like to throw their cigars or cigarettes away when entering a pavilion. Cancel the prohibition of smoking in the British Pavilions and you may be sure the proportion of visitors will rise. Could Great Britain for once be " practical "?

Ghent, Belgium. ROBERT ROOSE.

[We did not *complain* about the 10 per cent attendance at the British Pavilions at Brussels for the figure is regarded as fairly satisfactory. Our correspondent is only half right about smoking; actually it is prohibited in the Government display but permitted in the Industrial Pavilion.—Editors, *Electrical Review.*]

PERSONAL AND SOCIAL

News of Men and Women of the Industry

British Insulated Callender's Construction Co., Ltd., has announced the following board and management changes:—

Mr. G. H. Walton, joint general manager with **Mr. O. J. Crompton,** M.Eng., M.I.E.E., since 1956, has relinquished his executive duties on reaching retirement age. He continues to be available for consultation and for special duties and remains on the board of the company and also of British Insulated Callender's (Submarine Cables), Ltd., Painter Bros., Ltd., and Engineering Projects, Ltd. Mr. Crompton has been appointed general manager of the company. **Mr. G. A. Rendle,** B.Sc., M.I.E.E., has been appointed deputy general manager and continues to act as manager of the Power Cable and Telecommunication Cable Contracts Departments. **Mr. E. T. Q. Davies** has been appointed director and continues to act as manager of the Overhead Line Contracts Department.

The company also announces the retirement from the board of **Mr. F. B. Kitchin,** M.I.E.(Aust.), which took place on 30th June. Mr. Kitchin also relinquishes his directorship of British Insulated Callender's Cables (Australia) Pty., Ltd.

Mr. Walton joined the former British Insulated & Helsby Cables, Ltd., in 1914 as a contract engineer, and after holding various positions was appointed director and manager of overhead lines of British Insulated Callender's Construction Co., Ltd., in 1951, and he became joint general manager in 1956.

Mr. Crompton joined British Insulated Cables, Ltd., as a contract engineer in 1927 and has since served with the company and the present company, British Insulated Callender's Cables, Ltd., in various capacities, becoming director and manager, traction contracts, of the British Insulated Callender's Construction Co., Ltd., in 1949 and joint general manager in 1956.

Mr. Rendle joined Callender's Cable & Construction Co., Ltd., in 1920 as a contract engineer, and carried out telephone and power cable contracts both at home and overseas. Following the formation of British Insulated Callender's Cables, Ltd., he was appointed deputy cable contracts manager in 1946, and in 1954 was appointed director and manager, cable contracts, of the British Insulated Callender's Construction Co., Ltd.

Mr. Kitchin joined British Insulated & Helsby Cables in 1915 on electrification of the Victorian State Railways. After service with the Australian Imperial Forces in the 1914-18 war he rejoined the company in Australia. In 1923, on completion of the Victorian Railways contract, he was posted to Bombay to work on the Great India Peninsular Railway electrification contract. He came to England in 1931 to take up an appointment as railway electrification engineer, and on the formation of British Insulated Callender's Construction Co., Ltd., in 1949 he was appointed a director of the company and from 1951 to 1957 he served as resident director in Australia.

Mr. Davies joined Callender's Construction Co., Ltd., as a draughtsman in 1926. On the formation of British Insulated Callender's Construction Co., Ltd., he was appointed assistant contracts manager, in 1950 contracts manager, and in 1956 manager, overhead lines.

Mr. O. J. Crompton

Mr. G. H. Walton

Mr. G. A. Rendle

Mr. C. Buckle, A.M.I.E.E., has been appointed engineer-in-charge of the Droitwich transmitting station of the B.B.C. in succession to **Mr. D. A. G. Curd,** A.M.I.E.E., who has retired after thirty-four years' service.

Mr. Buckle joined the Corporation in 1938 as a maintenance engineer. After serving in this capacity with the television service at Alexandra Palace and at the B.B.C.'s sound transmitting stations at Burghead and Preston, he joined the Engineering Training Department in 1942 as an instructor, transmitters. In 1951 he was appointed engineer-in-charge, Holme Moss television transmitting station, a post which he held until taking up his present appointment.

Mr. Curd has been with the B.B.C. since the early days of broadcasting. He was first appointed in 1924 and posted to Plymouth, from where he pioneered many of the early outside broadcasts from the West Country. He has served as engineer-in-charge at a number of the Corporation's transmitting stations and became engineer-in-charge at Droitwich in 1951.

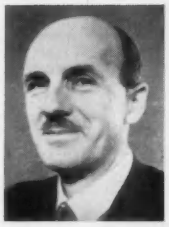
The South of Scotland Electricity Board has appointed **Mr. J. K. Lardner,** A.A.C.C.A., as accountant, Fife Area, and **Mr. J. Todd** as superintendent of Townhill generating station, Dunfermline. Mr. Lardner is at present principal assistant, accountancy, in the Chief Financial Officer's Department at Board headquarters, and Mr. Todd is shift charge engineer at Dalmarnock generating station, Glasgow.

Mr. K. C. Coop, M.Eng., M.I.E.E., A.M.I.Mech.E., who writes on "Substation Design" (page 295), was educated at King George V School, Southport, and Liverpool University and served a college apprenticeship course with the Metropolitan-Vickers Electrical Co., Trafford Park. During the years 1932-1946 he held various posts with the Yorkshire Electric Power Co., becoming senior technical engineer in the Mains Construction Department. In 1935 he was awarded a student premium of the I.E.E. for a paper entitled "The Pollution of Overhead Line Insulators" and he was hon. secretary to the North Midland Centre of the I.E.E. from 1938 to 1946.

Mr. K. C. Coop

Mr. Coop was deputy borough electrical engineer and manager to the Blackpool Corporation Electricity Department from 1946 to 1948 and from then until 1957 he was assistant chief engineer (construction) to the North Western Electricity Board; he is now senior assistant chief engineer (planning and design) following the merging of the system planning and development with the construction section.

The Steel Company of Wales announces that **Mr. I. S. Scott-Maxwell,** who has been unable to carry out his duties for some time because of illness, has now returned to full-time duties as assistant general manager (engineering and development) of the Steel Division of the company. At the same time the company has confirmed the appointment as chief engineer of **Mr. J. H. Groocock,** M.I.E.E. (formerly chief electrical engineer), who in the



Mr. J. H. Groocock

Mr. H. D. Morgan

absence of Mr. Scott-Maxwell has been carrying out the duties of acting chief engineer. **Mr. H. D. Morgan,** who during the same period has been acting chief electrical engineer, is now appointed chief electrical engineer.

After obtaining a degree at London University, Mr. Groocock gained his early training with Sulzer Bros., Switzerland. In 1934 he returned to this country to take up a post with Imperial Chemical Industries at Birmingham and in 1939 was transferred to Swansea, becoming regional electrical engineer of the Metals Division. He remained in that position until 1950 when he joined the Steel Company of Wales as chief electrical engineer of the Steel Division. He is a past chairman of the West Wales (Swansea) Sub-Centre of the I.E.E.

Mr. Morgan started his career in the Chief Electrical Engineer's Department of the L.M.S. Railway. During the war he served with A.A. Command and for the last two years was senior experimental officer of the Command's Trials and Experimental Establishment near Sheerness. On demobilisation he joined McLellan & Partners and was engaged on electrical design and construction of the Abbey Works. He transferred to the Steel Company of Wales in 1950 and was appointed Abbey Works electrical engineer and deputy chief electrical engineer of the Steel Division of the company.

Oldham & Son, Ltd., have made the following appointments:—**Dr. C. D. J. Statham,** previously in charge of mining division sales, becomes general sales manager; **Mr. T. J. Martin,** previously in charge of S.L.I. sales division, becomes purchasing manager; and **Mr. H. C. Edmonds,** previously export sales manager, S.L.I., is appointed sales manager, S.L.I. home and export.

Mr. H. H. Saint has been appointed general sales manager of Fawcett Preston & Co., Ltd., one of the engineering subsidiaries of the Metal Industries group. He will be responsible for all home sales. **Mr. E. P. Bridson,** formerly in charge of the company's London office, becomes export sales manager.

Mr. A. E. Crook, C.B.E., M.I.Mech.E., M.I.M.E., has been appointed chief engineer (production) to the National Coal Board. The Board's engineering services at headquarters have recently been reorganised under Mr. B. L. Metcalf (as director of engineering), to whom Mr. Crook will be responsible for mechanical engineering, electrical engineering, inspection, planned maintenance and standardisation. He has been H.M. Principal Inspector of Mechanical Engineering in Mines since 1944. Mr. Crook is a Fellow of the Association of Mining Electrical and Mechanical Engineers.

Mr. A. H. de Ritter, a senior lighting sales engineer in the A.E.I. Lamp & Lighting Co.'s southern regional office at Long Acre, London, has retired after twenty years' service. Mr. de Ritter was educated at Lancing College and worked in the shipbuilding and engineering industry and for a firm of consulting engineers before joining the Hotpoint Electric Appliance Co., Ltd., in 1937. Friends and colleagues in the company have given him a gold wristwatch and a cheque as a leaving present.

The London Electric Wire Co. & Smiths, Ltd., has appointed **Mr. T. Reed** as sales manager at its Leyton Works. He succeeds **Mr. J. R. Alexander,** who has been appointed European sales manager. Mr. Reed joined the company in 1946, and was attached to its Birmingham branch. In 1953 he became the manager of the Bristol branch and in July last year moved to the Leyton Works as assistant sales manager.

Mr. T. Reed

Mr. J. Stone, having reached the age of seventy, has relinquished his position as managing director of J. & F. Stone Lighting & Radio, Ltd., but retains his seat on the board and assumes the position of vice-chairman of the company, without remuneration. **Mr. S. Usick** and **Mr. M. Usick,** assistant managing directors, have been appointed joint managing directors.

Sir Charles Geddes, a part-time member of the Central Electricity Generating Board, who was recently created a life peer, has chosen as his new style Baron Geddes of Epsom.

Miss Dorothy Smith, of the Motor Engineering Department of the Metropolitan-Vickers Electrical Co., Ltd., has been elected to full membership of the Institution of Electrical Engineers. Until this year, no woman had achieved this distinction since Mrs. Hertha Ayrton in 1899. Miss Smith was educated at the Manchester High School for Girls, having been awarded a Foundation and County Scholarship. Upon matriculating, she joined the Metropolitan - Vickers Electrical Co., in 1916. After a few months in the transformer drawing office she transferred to the Electrical Engineering Department, at first on general work and twelve months later in the induction motor section, which shortly afterwards became a part of the newly-formed Motor Engineering Department in which she has worked ever since. As a member of the development section since 1927, she was one of the team responsible for the development of the "R" type induction motor, and has since been concerned with development work on a wide range of d.c. and a.c. rotating machines. Concurrently with her early work, Miss Smith gained the Manchester College of Technology associateship in electrical engineering. This, together with her design experience, led to her election as an

Miss Dorothy Smith

At the opening of the new head offices of Honeywell Controls, Ltd., reference to which is made on page 292. Mr. H. Sweatt (chairman of the Honeywell organisation) is on the extreme right, and with him are (left to right) Mr. V. D. MacLachlan (director and general manager); Mr. G. Ward (Mayor of Ealing); and Mr. E. C. Vorlander (managing director)

associate member of the I.E.E. in 1927. She joined the Women's Engineering Society in the early 1920's; from 1943 to 1945 she was chairman of the Manchester Branch, and has been continuously a member of the Council since 1947.

Mr. C. F. J. Southcott, A.A.C.C.A., administrative officer of the Somerset Group of the South Western Electricity Board, has just been appointed the Board's establishments officer. He succeeds **Mr. E. M. Hughes,** M.B.E., who last April was appointed deputy secretary of the Board.

Mr. C. F. J. Southcott

Mr. Southcott has been in the service of electricity undertakings in the West Country for twenty-six years. When the electricity supply industry was nationalised Mr. Southcott joined the South Western Electricity Board as deputy sub-area accountant, Taunton, and in 1954 was appointed Somerset Group administrative officer.

Mr. T. S. Crabtree, managing director of Arrow Electric Switches, Ltd., left by air on 6th August on a trip to Australasia. He will visit both the Australian and New Zealand Arrow plants in order to initiate expansion programmes. Mr. Crabtree is expected to be away for about seven weeks.

W. T. Glover & Co., Ltd., have announced the following appointments to the board:—**Mr. K. S. Brazier,** B.Sc.(Eng.), M.I.Mech.E., M.I.E.E., director (works), **Mr. M. D. Dixon,** M.B.E., M.A., M.I.E.E., director (sales), and **Mr. E. L. Davey,** B.Sc.(Eng.), M.I.E.E., director.

Mr. Brazier joined the company in 1940 and took over the responsibilities of works manager in 1946. He was appointed director and works manager of the British Insulated Callender's (Submarine Cables), Ltd., in 1954. He retains his directorship of that company in addition to his present appointment.

Mr. Dixon was appointed resident engineer of the company in India in 1930. He returned to England in 1946, after having served during the last war in the Indian Army, and was appointed export manager in 1950.

Mr. Davey joined the company in 1924 as research and development engineer and became chief engineer in 1950. He was appointed director and chief engineer of the British Insulated Callender's (Submarine Cables), Ltd., in 1954, and his present appointment is in addition to those responsibilities.

Mr. K. S. Brazier

Mr. M. D. Dixon

Mr. E. L. Davey

Mr. C. Payne has been appointed secretary of Brookhirst Switchgear, Ltd., Chester, one of the Metal Industries group of companies. He succeeds **Mr. N. Clark,** who has been appointed administrative assistant to Mr. H. O. Houchen, chief executive of the Brookhirst-Igranic organisation.

Col. E. J. S. Ward, M.V.O., M.C., has been appointed export director of Chilton Electric Products, Ltd. He is a brother of Mr. A. R. Ward, chairman of the company.

The British Transport Commission has appointed **Mr. R. C. Bond,** at present chief mechanical engineer, British Railways Central Staff, to succeed **Mr. J. Ratter** as technical adviser at Commission Headquarters on 1st October next, when Mr. Ratter will become a full-time member of the Commission.

In our last issue we reported the appointment of **Mr. F. T. Barwell,** Ph.D., B.Sc.(Eng.), M.I.Mech.E., A.M.I.E.E., as electric traction engineer (research), Electrical Engineering Department, British Railways Central Staff. We have since received a copy of his portrait which we now reproduce.

Dr. F. T. Barwell

The national final meeting of the **Electrical Industries National Golf Championship** will be held this year at Wentworth Golf Club, Virginia Water, on 29th September next. Apart from the final of the national championship, there are also competitions for veterans and visitors, details of which can be obtained from Mr. F. H. Farthing, hon. secretary, 22, Regent Hill, Western Road, Brighton, 1. The annual dinner will be held in the evening at the Park Lane Hotel, Piccadilly (7.30 for 8.30 p.m.), when the chair will be taken by Lord Chandos and the principal speaker will be Lord Brabazon.

The Midlands area final of the championship took place at Edgbaston Golf Club recently, over ninety competitors taking part. The prize-winners, who will go forward to the national final, are as follows:—Railing Cup: Best net score, Mr. J. Cox; Jacob Cup: Second best net, Mr. F. Williams; Best gross, Mr. E. Walton. The proceeds of this function, which took place in conjunction with a prize draw and presentation dinner, enable the Committee to forward to the national treasurer a sum of £350.

Mr. D. E. Jones has been appointed export manager of Alfred Imhof, Ltd., and **Mr. A. E. Mitchell** has been promoted to assistant sales manager.

OBITUARY

Mr. Guy Campbell.—By the death on 4th August of Mr. Guy Campbell the lighting industry has lost one of its most prominent members. Mr. Campbell, who was in his seventy-second year, held the position of chairman and managing director of the Benjamin Electric, Ltd., for forty-seven years. For about twenty years, up to 1955, he was also chairman and joint managing director of Holophane, Ltd., and he remained on that company's board until last year; he had served as a director of several other companies during his long career.

The late Mr. Guy Campbell

Mr. Campbell was a strong supporter of the Illuminating Engineering Society and he had served on a number of committees associated with the electrical industry. At one time he also developed a large motor-car accessory and radio component side for his company.

He leaves a widow, a son and two married daughters, to whom we extend our sympathy. His son, Mr. H. G. Campbell, T.D., M.A., A.M.I.E.E., A.M.I.Mech.E., F.I.E.S., is joint managing director of the Benjamin Electric, Ltd.

Mr. R. H. J. Briggs, F.I.A.C., who for the past twenty years had been assistant secretary of the British Electrical and Allied Manufacturers' Association, died on 2nd August. Mr. Briggs was secretary of the Foundation Co., Ltd., from its registration in 1921 until it was liquidated in 1930. He was previously with the English Electric Co. and Dick, Kerr & Co.

Mr. R. H. Weston.—The death has occurred, after a short illness, of Mr. R. H. Weston, the London manager of Jackson Boilers, Ltd. He had been with the company since 1926.

Mr. T. F. Stevens.—The death occurred on 8th August at the age of fifty-nine of Mr. Tom Frederick Stevens, of the Southern Electrical Co., electrical contractors, of Mitcham.

VIEWS on the NEWS

By REFLECTOR

TWO members of the London Electricity Board's staff Miss J. M. Knapman and Mr. F. W. Walker, have undertaken research into the history of electricity supply in the London area. They describe the nature of their work in the July-August issue of *London Electricity*. One illustration in their article shows Mr. Walker operating on a map of the area spread out on a floor. In the foreground, copies of the *Electrical Review* are prominent; they are being used to hold the map down. This confirms what I have often been told: that the *Review* carries some weight.

* * *

Eleven local committees affiliated to the Wales Gas Consultative Council were asked for their opinions on the suggested co-operation between Gas and Electricity Boards. The *Western Mail* says that while three committees were in favour of joint meter reading and billing eight were against it. All were opposed to common service centres because they thought it might lead to lack of competition and apathy and would be of no benefit to consumers. One committee (although presumably not against competition) said "there was evidence of wasteful competition in persuading consumers to change perfectly good appliances for electricity appliances and that some co-operation between the Boards might stop that practice." There are occasionally changes in the opposite direction, but I have not heard that Electricity Boards worry about them.

* * *

Opinions about the proposed Trawsfynydd nuclear power station remain divided although official approval has now been given to the scheme. Amenity protection societies are continuing their campaign against it, but others have expressed their satisfaction—mainly because the station will provide employment. The Farmers' Union of Wales is among the approving bodies and one new reason is mentioned by the *Western Mail*. Reference is made to the flooding of a large area in the low-lying parts of the Glaslyn Valley and, it is said:—

> "The advent of the nuclear power station would probably mean that the whole structure of the embankment would have to be considerably strengthened. This would be the opportunity for providing efficient control of the tidal waters as required by the farmers of the area who over many years had suffered devastating losses."

* * *

A heading in *The Kelvin* (the magazine of the South of Scotland Electricity Board) "Best Lit P.C. in Britain" does not indicate a new departure in the lighting art. The initials stand for "pedestrian crossings" and the article tells how two members of the Kilmarnock power station staff, Councillor T. Ryan and Mr. D. Taylor, secured an improvement in the lighting of Kilmarnock crossings. Mr. Taylor was responsible for the scheme and Councillor Ryan was instrumental in getting it approved by the Town Council. It appears that an installation consists of a 20ft column on each side of the crossing, each column bearing a 240 W sodium lamp.

* * *

Electrical people commonly complain that too little is spent on the electricity supply for new housing. A report published in the *Fortnightly Review* of the Bank of London and South America makes it appear as though this cannot be said of Ecuador. A plan for the reconstruction of the city of Esmeraldas, which suffered heavy earthquake damage last January, is estimated to cost about 30 million sucres (about £700,000). Of this housing will take 8·8 million sucres while 14 million sucres will be spent on electricity.

* * *

At the end of a report on the introduction of a new cooker by the Revo Electric Co., Ltd., the *Birmingham Weekly Post* says:—

> "The managing director of Revo is Mr. William Rigg, the only man first prize winner in the annual sewing contests which were such a popular feature of this paper. He privately told me that he is working on a frock in nylon straw with a foundation of black grosgrain."

The essential thing about a hobby is that it should be entirely different from one's ordinary job. Mr. Rigg certainly seems to have broken away entirely from cookers to find his leisure occupation. Dress design is, of course, very largely a male preserve.

* * *

Reference is made in *Carron Cupola* (the magazine of Carron Company) to "our wonderful new Press and Fabricating Department." This should not be thought to imply that the company has branched out into the newspaper business.

* * *

From the *Electrical Review* of 15th August, 1878:—

> "According to l'Electricité, the Paris Gas Company has published in several financial journals an article on the alarm caused by the progress of the electric light, intended to reassure the shareholders of gas companies. The article contests the possibility of substituting the electric light for gas in cities, and concludes that the gas companies run no danger. Energetic efforts are also being made to develop the use of gas for cooking and heating. Meanwhile the splendid lights of Lontin, Siemens and Jablochkoff steadily burn on, shaming the rows of sickly and feeble gas lights wherever they are seen beside the latter. Even so will truth outshine error, although error be supported by millions."

INDUSTRIAL NEWS

Diesel Locomotive Contracts

Further contracts for eighty-three main-line diesel locomotives are announced by the British Transport Commission in connection with the modernisation of British Railways. Of the locomotives ordered, sixty-three will be of 2,000 h.p. with a maximum speed of 90 m.p.h. for express passenger and freight services, and twenty will be of 1,100 h.p. capable of 75 m.p.h. on general mixed traffic duties. The North British Locomotive Co., Ltd., will supply thirty-three diesel-hydraulic locomotives of 2,000 h.p. (Type 4) and twenty diesel-electric locomotives of 1,100 h.p. (Type 2), and the English Electric Co., Ltd., will supply thirty diesel-electric locomotives of 2,000 h.p. (Type 4).

Anglo-American Nuclear Power Agreement

A five-year agreement has been concluded between the United Kingdom Atomic Energy Authority and the Power Reactor Development Company of Detroit, Michigan, for the exchange of information concerning fast nuclear reactors. This company is building a fast reactor power plant in Michigan. It is to be completed in 1960 and is said to be larger than the A.E.A.'s Dounreay experimental reactor which is to go into operation next year.

Mobile Generating Plant

Four 1,200 kW mobile diesel generating sets for Venezuela, constructed by Mirrlees, Bickerton & Day, Ltd., and the Brush Electrical Engineering Co., Ltd., members of the Hawker Siddeley Group, are now at the completion stage. The sets consist of one trailer for generation purposes and one for transformer duties. The generator trailer consists basically of a Mirrlees JVS16 turbo-charged diesel engine driving a Brush generator, with the necessary switchgear.

The alternator is rated continuously at 1,200 kW, 2,400 V, 60 c/s. Voltage is maintained constant by means of a carbon pile regulator. All switchgear is carried on the generator trailer as well as a 75 kVA auxiliary transformer which provides a 190 V three-phase or 110 V single-phase supply for all ancillary plant, lighting, etc., making it a completely self-contained unit independent of any outside supplies. The trailer is supplied complete with its own lighting system from a 24 V battery supply. The batteries are incorporated in the trailer with a separate charging plant. When the alternator is placed on load a separate lighting system automatically takes over, shutting down the battery system. The complete generator trailer weighs approximately 52 tons and is 50ft long, 10ft wide and 12ft high.

A transformer trailer is supplied with each generator trailer and carries a Brush 1,500 kVA, 2,400/13,800 V transformer. The complete transformer trailer is 12ft 6in long, 7ft 6in wide and 12ft high, weighing approximately 10 tons.

Mirrlees-Brush generating plant trailer

New Member of B.N.E.C.

The British Nuclear Energy Conference—set up in 1955—announces an increase in its membership to nine constituent bodies by the addition of the Joint Panel on Nuclear Marine Propulsion. This Panel consists of four bodies—the Institute of Marine Engineers, the Institution of Naval Architects, the Institution of Engineers and Shipbuilders in Scotland and the North East Coast Institution of Engineers and Shipbuilders.

Duty on Iron and Steel Products

Under the Import Duties (Exemptions) (No. 10), (No. 12) and (No. 16) Orders, 1957, the import duties on a wide range of iron and steel products are suspended until 18th September next. The suspension of duty on certain cold-reduced sheets and hot-rolled strip has been prolonged until 31st December by the Import Duties (Exemptions) (No. 8) Order, 1958. After consultation with the Iron and Steel Board about the supply position, the Government has decided that the suspension of duty should not be prolonged beyond 18th September on the remaining products, with the exception of a particular type of high-carbon steel wire rod. On this product the suspension of duty has been prolonged until 31st December.

Overhead "Floor Warming"

It is generally assumed that floor warming cables, as the description implies, are installed in the floor, but that they need not be is shown in the accompanying illustration sent us by

"Ashatherm" space heating cables being installed in the ceiling of a bungalow

Aerialite, Ltd., of "Ashatherm" space heating cables being installed by a builder in the ceiling of one of his bungalows. The picture shows the engineer tacking the cable into position, following which the ceiling was skimmed and plastered.

Siemens Edison Swan Exhibition

Last week we had an opportunity of seeing an exhibition of some of the products of the two subsidiary companies of Siemens Edison Swan, Ltd., which has been arranged at its premises at 155, Charing Cross Road, London, W.C.2. This takes the form of a number of illuminated showcases, and although it is impossible to display more than a comparatively small selection of their products, the result has been to present a general indication of the wide field covered by the seventeen product divisions. Each showcase is devoted to a particular section of the group's business, and the display includes lamps and lighting equipment, valves and radio components, cathode ray tubes, plastic mouldings, wiring accessories, batteries and accumulators, telecom-

An exhibition at the Charing Cross Road, London, premises of Siemens Edison Swan, Ltd.

munications equipment, and marine equipment. A private automatic telephone exchange actually in use on the premises can also be seen in operation. The exhibition will continue for some months to come, and changes in the displays will be made from time to time.

A.S.E.E. Diplomas and Certificates

At the May examinations under the diploma scheme of the Association of Supervising Electrical Engineers, held in London, Birmingham, Manchester and Bristol, eight candidates secured the A.S.E.E. diploma and twelve the technician's certificate. Details of the scheme can be obtained from the general secretary of the Association at 23, Bloomsbury Square, London, W.C.1.

Royal Lancashire Show

The stand of the North Western Electricity Board was again a popular attraction of the Royal Lancashire Agricultural Show held at Blackpool from 29th July to 1st August. Apart from general examples of electricity applied to farming, the agricultural section had four special displays. They were the mammoth brooder, catering for 1,000 day-old chicks; "do-it-yourself" multi-purpose crop drying units; deep freezers for the storing of farming produce; and the drying of hay in bale by electricity. The horticultural side illustrated electrical methods for producing early tomatoes. Of special interest was a giant tomato plant which climbed 15ft above the glasshouse, the centre-piece of the horticultural exhibit.

Works Visits

Sunvic Controls, Ltd., recently entertained more than sixty visitors from France and leading industrial concerns in this country at its Harlow, Essex, factory. The main reason for this "open day" was to show guests the first completed units for the data handling system being supplied by Sunvic for the U.K.A.E.A. uranium diffusion plant at Capenhurst. The visitors also saw the assembly and testing of electronic instruments such as pulse height analysers and strip chart recorders, assembly and test of thermal components, and they visited the newly-opened training school. The company's mobile exhibition caravan was available for the demonstration of pneumatic process control equipment.

Electrical wholesalers from Yorkshire visited the Atlas lamp works at Merthyr Tydfil on 8th July. They travelled the previous day from Leeds to Monmouth (where they stayed the night) and after dinner, at which Mr. J. G. Christopher, general sales manager, presided, were shown the Atlas film, "Fitting Conclusions." Each visitor was presented with a box of four Atlas electronically tested lamps in the new eight-sided pack, and a Caerphilly cheese as mementoes.

London Transport Training Centre

Sir John Elliot, chairman of London Transport, last week officially opened an apprentice training centre at the Acton central railway overhaul works and unveiled a small plaque in the entrance lobby to commemorate the occasion. This training centre brings together in one place for the first time all the instructional facilities for apprentices at the works.

The new single-storey building is divided into a workshop, lecture room, locker and wash rooms, supervisor's office and waiting room. The equipment installed in the workshop includes a variety of machine tools of the normal production type for elementary operations and for advanced instruction in setting up. In the lecture room accommodation is provided for 30 persons and there are facilities for film projection and the use of an epidiascope.

Interior of the workshop at the training centre for railway engineering apprentices at London Transport's Acton Works

Electrical Contracting Country Allowance

Negotiations begun last February between the Electrical Trades Union and the National Federated Electrical Association were completed on 7th August when it was agreed that the country allowance paid to men sent to jobs necessitating their lodging away from home should be increased from 9s to 9s 6d a night as from 1st September. The N.F.E.A. has always insisted that the country allowance is not intended to cover all expenses incurred in working away from home, and that the amount agreed should be a fixed sum, so that when tendering a contractor would be in a position to assess his labour costs.

Submarine Cable Contracts

In addition to the order received for undersea cable and submerged repeaters for the Anglo-Swedish cable project, reported on page 299 in this issue, Standard Telephones & Cables, Ltd., has also received an order for deep sea cable, part of a new 36-channel telephone system to be installed next year between Miami, Florida, and San Juan, Puerto Rico. The value of the contract is $2½ million. The contract has been placed by the Western Electric Co. of New York. It calls for the supply of over 700 nautical miles of deep sea type coaxial cable. The total route length of the link will be more than 1,100 miles, and the system will be similar to the first transatlantic telephone cable link. It will comprise two cables, each equipped with American type flexible one-way repeaters, for east and west transmission, respectively. The system will be owned jointly by the American Telephone & Telegraph Co. and the International Telephone & Telegraph Corporation. The cable will be manufactured by S.T.C.'s

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Southampton factory, where special machinery has been installed. It will be laid in very deep water. The completed cable weighs 3¼ tons per nautical mile, and will be manufactured in continuous repeater section lengths of about 38 nautical miles. After testing the sections will be joined together by means of the flexible repeaters to be supplied by the Western Electric Co., New York. Cable and repeaters, totalling about 2,500 tons in weight, will be loaded direct from the Southampton factory into the tanks of H.M.T.S. *Monarch*, which will be used to lay the cable and repeaters towards the end of 1959.

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The new head office building of Honeywell Controls, Ltd., at Greenford

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Fire Refined 99·70%	ton £206 0s 0d
Fire Refined 99·50%	ton £205 0s 0d
COPPER Tubes ..	lb 1s 11⅝d
Sheet	ton £235 15s 0d
H.C. wire and strip ..	ton £257 5s 0d
LEAD, English ..	ton £71 5s 0d
Foreign	ton £70 0s 0d
MERCURY	flask £79 0s 0d
TIN, block (English) ..	ton £730 5s 0d
ZINC, G.O.B. Foreign	ton £64 5s 0d
BRASS Tubes (solid drawn)	lb 1s 7⅜d
Wire	lb 2s 5½d
PHOSPHOR BRONZE Wire	lb 3s 9½d
PLATINUM	oz £23 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 23½d-24d

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PLESVAC. No. 774,011. Class 9. Electrical apparatus and instruments and parts, all incorporating metal to glass seals.—Plessey Co., Ltd., 1, Broad Street Place, London, E.C.2, and 56, Vicarage Lane, Ilford, Essex.

UNIWELD. No. B774,954. Class 9. Welding electrodes.—Metafol (London), Ltd., 70, Finsbury Pavement, London, E.C.2.

PIGENESTER. No. 776,224. Class 9. Insulated electric wire and insulated electric strip.—Pirelli-General Cable Works, Ltd., 343-345, Euston Road, London, N.W.1.

EBOR. No. B775,478. Class 10. Blankets and pads for warming and airing beds, all being electrically heated goods. EBOR. No. B773,785. Class 11. Heating apparatus.—H. J. Baldwin & Co., Ltd., Baldwin House, 132, Arkwright Street, Nottingham.

POPOLA. (design). No. 774,335. Class 11. Electrically operated apparatus and appliances and parts.—A.E.I. Lamp & Lighting Co., Ltd., Crown House, Aldwych, London, W.C.2.

FALKS UNIPLUS. No. 775,392. Class 11. Fluorescent lighting installations and parts.—Falk, Stadelmann & Co., Ltd., Veritas House, 91, Farringdon Road, London, E.C.4.

NEW BOOKS

Telecommunication Economics. By T. J. Morgan, A.M.I.E.E. Pp. 452; figs. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 50s.

This book describes, in the light of British Post Office experience, the main factors and procedures which are generally applicable to the economic engineering of a telecommunications system. The first portion, nearly one-third of the whole, deals with general principles and the methods followed in an economic choice between alternative engineering projects. This section covers interest formulæ, depreciation accounting, life of plant, and methods of study, and it includes a useful chapter on statistics and probability. The treatment is clear and comprehensive although some minor omissions must be noted. Thus, in comparing the sinking fund and straight line methods of depreciation provision, the variations in the annual burden of charges under the second method should have been pointed out. In reference to the group method of depreciation accounting, it should be made clear that each group must consist of assets having the same length of life. The word " depreciation " is used throughout the book purely as an accounting term to cover the reduction in " book " value of an asset over its service life. There is little discussion of depreciation as a physical process or of the effect thereon of inflation, and hence the vexed question of historic-cost versus replacement-cost provision does not arise.

The remainder of the book covers the general field of telecommunications engineering planning with special reference to its economic aspects. It includes chapters on installation and replacement studies of automatic exchange systems and subscribers' local line schemes, planning and forecasting, multi-exchange area layouts, main line plant, traffic routing and rural automisation. A final chapter describes the use of the capitalised cost method for studies involving the provision of plant in uniform instalments to meet a growing demand. The appendices include compound interest tables and traffic capacity equations.

The author is to be congratulated on the down-to-earth manner in which he has illustrated his precepts by detailed and realistic examples. Many of these are obviously based on actual studies, and whilst the names and costs are hypothetical there is good justification for the relative values employed. Although the work is addressed primarily to telecommunications engineers (to whom it should prove extremely valuable) most of the principles and many of the actual methods should be applicable to other utility organisations. Power supply engineers should certainly read it if only for the salutary experience of discovering how much more scientific and thorough economic planning appears to be in the field of communications.—D.J.B.

The Social History of Lighting. By W. T. O'Dea. Pp. xvi + 254; figs. Routledge & Kegan Paul, Ltd., Broadway House, 68-74, Carter Lane, London, E.C.4. Price 42s.

For countless centuries man has made use of artificial light to enable him to pursue his activities after nightfall, although until comparatively recently this was only possible to a very limited extent. It is therefore rather surprising that the literature of the subject is so scanty. Perhaps the explanation is that, as Mr. O'Dea explains, there was very little progress to be recorded until the invention of the Argand lamp. He writes, " From fifteen or more millennia before Christ to A.D. 1782 there was practically no improvement in lighting at all." The crude oil lamp of 4,000 to 5,000 years ago showed only advances in design or in convenience, none in principle or, to any marked extent, in efficiency. The candle in its various forms, too, persisted for centuries without any marked alteration. The present volume, therefore, must have necessitated painstaking research over many years to build up, from references (often quite incidental) in contemporary writings, some picture of what artificial light has meant to man and the influence it has exerted on his social behaviour. The result is a book of absorbing interest not only to the lighting engineer but perhaps even more to the student of social history.

To a large extent each chapter deals with the history of lighting in one particular application, e.g. in the home, for work, for travel, and so on, but there is also an introductory chapter entitled " Bad Light " and two at the end dealing respectively with the essential materials used in lighting at various epochs and the means used for " getting a light." The illustrations are good, most of the line drawings being by the author, from contemporary objects or sources.—J.W.T.W.

Medical Electrical Equipment. Edited by R. E. Molloy. Pp. 323; figs. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 35s.

Anyone who has followed the recent " live " television medical series, or visited the " Electricity in Hospitals " feature at this year's A.S.E.E. Exhibition, cannot fail to have been impressed by the way in which electricity, in one form or another, is now applied in the treatment of injury or disease, and by the contribution made by electrical equipment to the general well-being of the hospital community. It is, therefore, gratifying to have this book in which a number of specialist writers explain lucidly and simply the requirements of the hospitals, the means of meeting them, and the care that needs to be taken if hospital electrical apparatus is to be safely operated to best advantage.

The book, however, tends to encompass too much, some of the detail described concerning the surgeon rather than the hospital staff, engineer or purchasing officer to whom the book will be of most use. The editor has obviously found it hard to know where to draw the line. This possibly accounts for the fact that although some reasons for the use of hypothermia equipment are mentioned, an important reason—that at lower temperatures the brain needs less oxygen—is omitted. It is also surprising that while hypothermia is mentioned, the bubble-oxygenator, or heart-lung machine, which requires a deal of preparation by medical staff before the cardiac surgeon can operate, is not. Again, electro-myography, electro-encephalography and various ultrasonic equipment are adequately mentioned, while medical nuclear physics receives scant attention and the increasing use of colour television—the latest development of which enables surgeons and pathologists to examine together tissue removed from a patient during an operation—is omitted.

Another criticism—although it is difficult to see how it can be overcome—is that the contributors are mostly drawn from individual specialist firms and inclined to over-emphasise the particular advantages of the equipment with which they are most familiar. For example, lighting fittings forming an integral part of a domed theatre ceiling, now finding particular favour with surgeons, are

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Southampton factory, where special machinery has been installed. It will be laid in very deep water. The completed cable weighs 3½ tons per nautical mile, and will be manufactured in continuous repeater section lengths of about 38 nautical miles. After testing the sections will be joined together by means of the flexible repeaters to be supplied by the Western Electric Co., New York. Cable and repeaters, totalling about 2,500 tons in weight, will be loaded direct from the Southampton factory into the tanks of H.M.T.S. *Monarch*, which will be used to lay the cable and repeaters towards the end of 1959.

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Foreign	ton	£70 0s 0d
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MY DAY. No. B764,697. Class 9. Electric batteries and cases for electric pocket lamps.—Motokov, Podnik Zahranicniho Obchodu, Prague, Czechoslovakia. Address for service, c/o Reddie & Grose, 6, Bream's Buildings, London, E.C.4.

PLESVAC. No. 774,011. Class 9. Electrical apparatus and instruments and parts, all incorporating metal to glass seals.—Plessey Co., Ltd., 1, Broad Street Place, London, E.C.2, and 56, Vicarage Lane, Ilford, Essex.

UNIWELD. No. B774,954. Class 9. Welding electrodes.—Metafol (London), Ltd., 70, Finsbury Pavement, London, E.C.2.

PIGENESTER. No. 776,224. Class 9. Insulated electric wire and insulated electric strip.—Pirelli-General Cable Works, Ltd., 343-345, Euston Road, London, N.W.1.

EBOR. No. B775,478. Class 10. Blankets and pads for warming and airing beds, all being electrically heated goods. EBOR. No. B773,785. Class 11. Heating apparatus.—H. J. Baldwin & Co., Ltd., Baldwin House, 132, Arkwright Street, Nottingham.

POPOLA. (design). No. 774,335. Class 11. Electrically operated apparatus and appliances and parts.—A.E.I. Lamp & Lighting Co., Ltd., Crown House, Aldwych, London, W.C.2.

FALKS UNIPLUS. No. 775,392. Class 11. Fluorescent lighting installations and parts.—Falk, Stadelmann & Co., Ltd., Veritas House, 91, Farringdon Road, London, E.C.4.

NEW BOOKS

Telecommunication Economics. By T. J. Morgan, A.M.I.E.E. Pp. 452; figs. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 50s.

This book describes, in the light of British Post Office experience, the main factors and procedures which are generally applicable to the economic engineering of a telecommunications system. The first portion, nearly one-third of the whole, deals with general principles and the methods followed in an economic choice between alternative engineering projects. This section covers interest formulæ, depreciation accounting, life of plant, and methods of study, and it includes a useful chapter on statistics and probability. The treatment is clear and comprehensive although some minor omissions must be noted. Thus, in comparing the sinking fund and straight line methods of depreciation provision, the variations in the annual burden of charges under the second method should have been pointed out. In reference to the group method of depreciation accounting, it should be made clear that each group must consist of assets having the same length of life. The word "depreciation" is used throughout the book purely as an accounting term to cover the reduction in "book" value of an asset over its service life. There is little discussion of depreciation as a physical process or of the effect thereon of inflation, and hence the vexed question of historic-cost versus replacement-cost provision does not arise.

The remainder of the book covers the general field of telecommunications engineering planning with special reference to its economic aspects. It includes chapters on installation and replacement studies of automatic exchange systems and subscribers' local line schemes, planning and forecasting, multi-exchange area layouts, main line plant, traffic routing and rural automisation. A final chapter describes the use of the capitalised cost method for studies involving the provision of plant in uniform instalments to meet a growing demand. The appendices include compound interest tables and traffic capacity equations.

The author is to be congratulated on the down-to-earth manner in which he has illustrated his precepts by detailed and realistic examples. Many of these are obviously based on actual studies, and whilst the names and costs are hypothetical there is good justification for the relative values employed. Although the work is addressed primarily to telecommunications engineers (to whom it should prove extremely valuable) most of the principles and many of the actual methods should be applicable to other utility organisations. Power supply engineers should certainly read it if only for the salutary experience of discovering how much more scientific and thorough economic planning appears to be in the field of communications.—D.J.B.

The Social History of Lighting. By W. T. O'Dea. Pp. xvi + 254; figs. Routledge & Kegan Paul, Ltd., Broadway House, 68-74, Carter Lane, London, E.C.4. Price 42s.

For countless centuries man has made use of artificial light to enable him to pursue his activities after nightfall, although until comparatively recently this was only possible to a very limited extent. It is therefore rather surprising that the literature of the subject is so scanty. Perhaps the explanation is that, as Mr. O'Dea explains, there was very little progress to be recorded until the invention of the Argand lamp. He writes, "From fifteen or more millennia before Christ to A.D. 1782 there was practically no improvement in lighting at all." The crude oil lamp of 4,000 to 5,000 years ago showed only advances in design or in convenience, none in principle or, to any marked extent, in efficiency. The candle in its various forms, too, persisted for centuries without any marked alteration. The present volume, therefore, must have necessitated painstaking research over many years to build up, from references (often quite incidental) in contemporary writings, some picture of what artificial light has meant to man and the influence it has exerted on his social behaviour. The result is a book of absorbing interest not only to the lighting engineer but perhaps even more to the student of social history.

To a large extent each chapter deals with the history of lighting in one particular application, e.g. in the home, for work, for travel, and so on, but there is also an introductory chapter entitled "Bad Light" and two at the end dealing respectively with the essential materials used in lighting at various epochs and the means used for "getting a light." The illustrations are good, most of the line drawings being by the author, from contemporary objects or sources.—J.W.T.W.

Medical Electrical Equipment. Edited by R. E. Molloy. Pp. 323; figs. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 35s.

Anyone who has followed the recent "live" television medical series, or visited the "Electricity in Hospitals" feature at this year's A.S.E.E. Exhibition, cannot fail to have been impressed by the way in which electricity, in one form or another, is now applied in the treatment of injury or disease, and by the contribution made by electrical equipment to the general well-being of the hospital community. It is, therefore, gratifying to have this book in which a number of specialist writers explain lucidly and simply the requirements of the hospitals, the means of meeting them, and the care that needs to be taken if hospital electrical apparatus is to be safely operated to best advantage.

The book, however, tends to encompass too much, some of the detail described concerning the surgeon rather than the hospital staff, engineer or purchasing officer to whom the book will be of most use. The editor has obviously found it hard to know where to draw the line. This possibly accounts for the fact that although some reasons for the use of hypothermia equipment are mentioned, an important reason—that at lower temperatures the brain needs less oxygen—is omitted. It is also surprising that while hypothermia is mentioned, the bubble-oxygenator, or heart-lung machine, which requires a deal of preparation by medical staff before the cardiac surgeon can operate, is not. Again, electro-myography, electro-encephalography and various ultrasonic equipment are adequately mentioned, while medical nuclear physics receives scant attention and the increasing use of colour television—the latest development of which enables surgeons and pathologists to examine together tissue removed from a patient during an operation—is omitted.

Another criticism—although it is difficult to see how it can be overcome—is that the contributors are mostly drawn from individual specialist firms and inclined to over-emphasise the particular advantages of the equipment with which they are most familiar. For example, lighting fittings forming an integral part of a domed theatre ceiling, now finding particular favour with surgeons, are

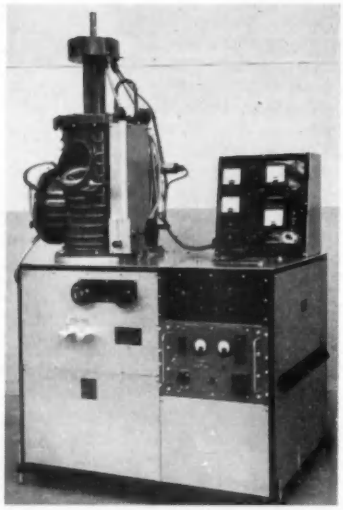
omitted from the relevant chapter on operating theatre lighting and there is no mention of equipment for rotary tomography of the skull in the sections dealing with X-ray apparatus.

In spite of these criticisms, this book fulfils a long-felt need and is symptomatic of the vigorous progress of electricity in all branches of medicine. It will undoubtedly be very valuable to medical staff, hospital planning authorities, purchasing officers and engineers. With the proposed capital expenditure on hospitals being increased during 1959-60 to £22 million it could not have been published at a more opportune time.—J.H.

Silicon Crystal Pulling Unit

IN the manufacture of transistors, semi-conductor crystals of controlled purity are required and these are normally "grown" either in an inert atmosphere or under vacuum. A number of special furnaces for this purpose have recently been made by Edwards High Vacuum, Ltd., Manor Royal, Crawley, Sussex. The "Speedivac" silicon crystal pulling units are flexible equipments which can be modified by the user with the minimum of effort and expense to suit individual requirements peculiar to the art of crystal pulling. They are suitable for both development work and full-scale production.

The pumping system consists of a 6in oil diffusion pump capable of a final vacuum of better than 5×10^{-6} mm Hg and having a baffled speed of more than 300 litres/sec. A baffle and isolation valve are mounted above the diffusion pump which is backed by a 15 cu ft/min rotary pump. The rotary pump outfit is mounted separately on the floor and connected to the diffusion pump by flexible connection to minimise vibration. A small 1in oil diffusion pump is also fitted to the equipment for evacuating the "screen tube" surrounding the crystal pulling rods, thus ensuring that no oil or grease contaminates the growing chamber. The whole pumping system is fitted with isolation and control valves and protective devices. Vacuum measurement in the plant is provided by Pirani and Penning type vacuum gauges which are mounted on the top of the cabinet housing in a complete instrument panel. The same panel also contains the instrumentation for the other electrical equipment which is used on the plant.



Edwards "Speedivac" crystal pulling unit

The remainder of the equipment comprises a crystal growing chamber with hoist and rotating mechanism for raising and rotating the crystal during its growth. The growing chamber is about 2in high and is provided with pumping and loading ports and viewing windows. The hoist and rotating mechanism is contained in a flanged metal casing 16in high and this is mounted directly on to the cover of the main vacuum chamber. The crystal pulling rod is arranged for variable rates of rotation and pull. The entire apparatus is housed in a stove enamelled metal cabinet, the dimensions of which vary according to whether the rotary pump is mounted externally or internally. The cabinet is 3ft 6in high by 3ft 8in wide by 3ft deep and the overall height of the plant to the top of the crystal mechanism is almost 7ft.

RADAR SPEED CHECK

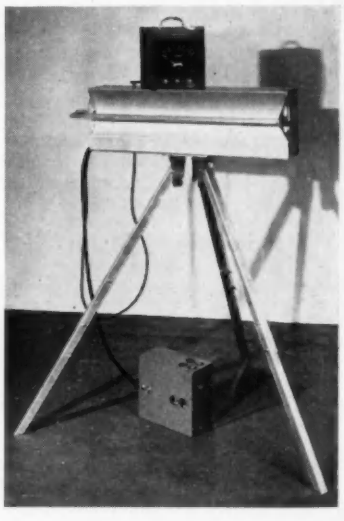
THE first radar speed check equipment to be designed and manufactured in Great Britain is announced by Marconi's Wireless Telegraph Co., Ltd., Chelmsford, Essex. The device, which is known as "PETA" (Portable Electronic Traffic Analyser), removes one of the major objections to the use of radar as a means of checking the speed of road vehicles in that it can discriminate between individual vehicles even under conditions of dense traffic. It will provide separate readings for vehicles which are only 8ft apart and will automatically lock-on to any individual reading if so desired. The speed range of the equipment is from 2 m.p.h. to 80 m.p.h. but this can be extended if required. The accuracy of speed assessment is within 1 m.p.h.

"PETA" employs the Doppler effect of frequency change which occurs when electromagnetic waves are reflected from moving objects. This principle, in conjunction with the extremely narrow horizontal beam-width of the radiated signals (between 3 deg and 4 deg), provides simplicity of design, portability and high accuracy of measurement, giving the user a device which calls for no technical skill in its operation. Extensive use has been made of transistors and printed circuits to achieve compactness.

The complete equipment, which weighs only 21 lb, consists of a transmitter/receiver unit, with its associated aerial, and a meter unit. In practice, the aerial unit forms a baseplate for the transmitter/receiver unit and the equipment can be placed in the open boot of a car with the aerial facing the oncoming traffic, or taken outside as convenient. The natural "squint angle" of the aerial is such that when the latter is physically at right angles to the road, the transmitted beam is directed at the required angle of 20 deg to the line of traffic.

The equipment operates in the "X" band and gives an FM/CW output of 4-10 mW from a klystron feeding into a slotted waveguide aerial with flare. This provides a working range between 8ft and 150ft. A calibrating signal at 30 m.p.h. or any other datum figure is provided. Power consumption is 2 A from a standard 12 V car battery.

The potential uses of "PETA" are by no means confined to the operation of speed checks. By the use of a 35 mm camera attachment and an analyser unit now being developed, a record can be provided of the speed and frequency of traffic at any particular road point. The standard version of the equipment incorporates a single channel system; if discrimination between near and far lane traffic is required a double channel system is available for fitting as an optional extra. The cost of "PETA" is likely to be under £500.



Marconi radar speed check equipment

SUBSTATION DESIGN

The design of 33 kV substations from the operational, constructional and aesthetic points of view is discussed. Stress is laid upon the need for adequate access both for safety and installation purposes. Methods of cable entry other than trenches are preferred.

By K. C. COOP, M.Eng., M.I.E.E., A.M.I.Mech.E.*

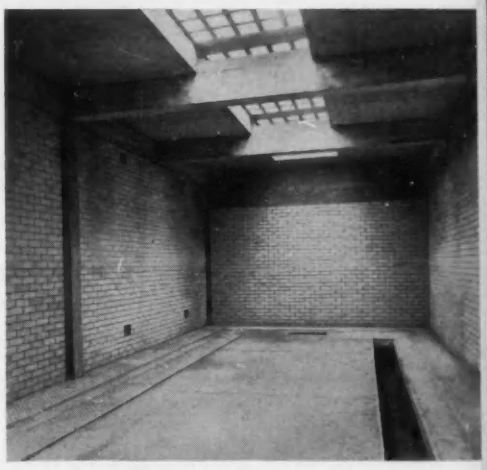


Fig. 1.—33 kV control room during construction showing roof lights, multi-core cable trenches and lime-sand facing bricks

THE design of substations must comply as far as possible with the requirements of three main influences, namely, the operational, the constructional, and the æsthetic. The operation engineer will insist that the design should provide easy and unimpeded access to and between all sections of the building and to the portions of the substation plant and equipment requiring regular maintenance. Adequate segregation and partitioning of the plant is necessary to minimise the effects of a fire or explosion, thus ensuring reasonable continuity of supply from the substation. A means of escape, in the event of a fire or explosion, must be provided from any position in the substation at which personnel may be required to work.

Adequate space is essential and a means of access to permit the installation of substation equipment is required during construction. An economical construction can be obtained by disposing the plant and equipment advantageously and, as a result, reducing, for example, the cost of interconnecting cables. Construction materials should be readily available, but at the same time have good lasting properties, bearing in mind that the life of the building is likely to be at least forty years.

From the æsthetic point of view, it is important that the substation shall conform pleasingly with the local surroundings. This does not necessarily entail designing it in such a fashion that it is unrecognisable as a substation; it plays such an essential part in the present-day community that it seems reasonable to suggest that the public should be aware of its presence. Nevertheless, it must raise and never lower the architectural level of its environment. This will certainly entail giving considerable thought to the screening from view of such items of equipment as large transformers which are nowadays invariably installed out of doors.

In what manner, therefore, can all these requirements be met and to what extent can standardisation be achieved in the design of large substations? The type of substation under consideration is the step-down transformer station containing 33 kV and either 11 kV or 6·6 kV switchgear with duplicate transformers of approximately 15 MVA capacity.

Operational Access

Easy and unimpeded access to and passage between the various parts of the substation implies that there should be no long corridors or unexpected changes in floor level. There must be adequate lighting both natural and artificial in the switch-houses and control room. There must be adequate passageway in front of and behind switchboards, control and relay panels.

Wherever possible there should be a single entrance for all operating personnel and access to the substation via emergency exits should be prevented. It is recommended that the layout of the substation should provide for the main entrance to give immediate access to a small lobby from which direct entrance to rooms housing all the main items of equipment can be obtained. As examples, it is desirable that there should be access from the entrance lobby to the 33 kV switch-houses, the control and relay room, the battery and CO_2 rooms. It is frequently difficult to attain this ideal when the substation contains both 33 kV and 11/6·6 kV switch-houses and in such instances it may be necessary to compromise by providing separate entrances for the 33 kV and 11 kV sections with the control and relay room so arranged that access to it can be gained from either entrance. It is not considered advisable to provide a door leading from the control room into the switch-house since, in the event of a fire in the switch-house, it is essential that it should not spread to the control room or affect it in any way.

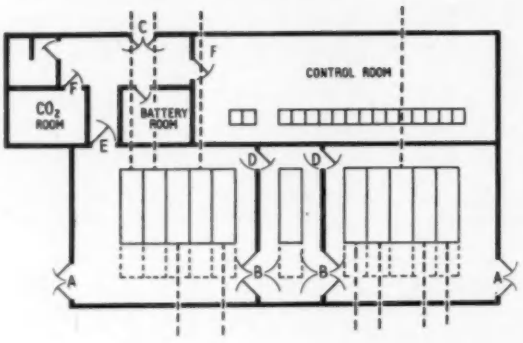
The provision of windows in substation buildings has long been a bone of contention with engineers, particularly when the substation is normally unattended. Stone throwing, additional heat losses and increased building costs have been set against elevational treatment from the æsthetic point of view, increased cleanliness resulting from the revealing properties of more light and the theory that a window may act as a pressure relief in the event of an explosion.

In view of the freak results of explosions, it is doubtful whether this theory can be substantiated, but a well-lit substation is kept cleaner and it is suggested that the provision of windows of glass lenses placed high in the walls of the substation, so as not to provide too accessible a target, is a practical compromise. As an alternative, roof lights may be provided, but these should be of the double-lens type set in concrete and positioned above the roof rather than set flush with the surface of the roof. The double lens will do much to eliminate condensation of moisture on the glass which can create a danger if allowed to fall as droplets on switchgear (see Fig. 1). Hollow glass bricks should be avoided as they are liable

* North Western Electricity Board.

to explode when heated. A disadvantage of the roof light in a switch-house is the additional temperature rise of busbars due to sun heat.

In view of the various designs of switchgear, it is difficult to lay down any hard and fast rules regarding the space to be provided behind switchgear. In some cases, for example, main cable boxes and multi-core terminal boxes are mounted against the rear wall, connections to the switchgear being by trunking, condenser bushings or



Type	Main Purpose	Construction
A	Switchgear Loading	Fire resisting
B	Switchgear Loading	Fireproof
C	Equipment Loading	Normal
D	Panic Exit	Fireproof
E	Normal Entrance	Fire resisting
F	Normal Entrance	Normal

Fig. 2.—Access doors in typical substation

conduit. However, to allow for ease in cable jointing, maintenance and unimpeded passage, there should be a walkway not less than 2ft 6in in width and if there are limitations to the height, it should be not less than 7ft. The space in front of the switchgear should be such as to allow free walking space along the length of the substation with any circuit-breaker withdrawn fully from the unit. A distance of 3ft between the front of the withdrawn breaker and the wall is considered adequate for this purpose, but may be found to be somewhat restrictive during erection.

After allowing for future extension units and the housing of such items as switch handling trucks, a clear space of 3ft should be allowed at each end of the switch room.

Consideration must also be given to space requirements in the control and relay room. For use with 33 kV switchgear a vertical combined control and relay cubicle measuring 2ft wide by 1ft 6in to 2ft deep and approximately 7ft in height is generally adopted. With rear opening doors, a minimum distance of 2ft between the back of the cubicle and the rear wall is necessary and this might well be increased to permit free passageway with the cubicle doors fully open. Experience has shown that a space less than 8ft in front of the control cubicles tends to produce a cramped appearance and prevents a clear view of the whole board, particularly when two rows of control panels are installed face to face.

Segregation

With 33 kV and lower voltage switchgear, the boards are usually divided into two or more sections controlling duplicate feeders or ring mains and fireproof walls taken to the full height of the switch-house should be provided on each side of the bus section unit or units. The holes in the walls through which the busbar chambers pass must be properly built up and filled to eliminate small apertures.

The fire segregation must also be extended to cover the main and auxiliary cabling. Wherever possible, cable trenches should be avoided, but where it is necessary to provide them, they should not run through from one section to another. They should either be stopped at the bus section fire wall or be completely sealed from that point onwards.

Oil drains should be provided beneath each circuit-breaker and piped to a soakaway having an oil capacity of not less than that of two circuit-breakers. As an added precaution, grids piped to the soakaway may be provided on each side of the intercommunicating doors.

In addition to fire segregation, some form of fixed fire fighting equipment is considered necessary in major substations containing 33 kV switchgear. For this purpose, CO_2 has much to commend it as compared with other methods. It is clean and leaves no after-effects; it is self-contained and the installation can be extended without difficulty; no damage is caused to the switchgear by the gas.

Operation of the CO_2 equipment is usually initiated by fusible detectors, the gas valves being opened by falling weights. A pressure-operated system in which the fusible link lines are replaced by a sensitive diaphragm and capillary tubing has much to commend it as an alternative.

In specifying the capacity of the installation, a concentration of 50 per cent by volume of the protected chamber is called for which allows for some loss of gas through doors and windows.

For a two-section switchboard with a bus section unit between sections, the installation is arranged to discharge this concentration automatically into one or other of the main sections. A separate bank of bottles is provided to give the same concentration in the smaller bus section chamber. In the event of the fire re-igniting when the concentration has been reduced by dispersion, the smaller bank may be arranged to act as a reserve and is discharged manually into either of the switch-houses via an interconnecting valve; the extra complications to the system do not, however, appear to be justified.

To ensure the safety of personnel working in the substation which is normally unattended, individual sections of the CO_2 installation may be locked off, an indication of the state of the installation being given by an illuminated sign placed in a prominent position adjacent to the main entrance. It is essential that the method of operation and the layout of the CO_2 installation should be fully understood by the operating staff and the judicious use of colour in the painting of pipe-work, link lines, etc., is to be recommended. A clear diagram of the CO_2 system showing the functions of all valves and the relative dispositions of pipe-work should be mounted adjacent to the CO_2 valve assembly.

Safety of Personnel

In considering the layout of a substation building in relation to the safety of personnel, the guiding principle should be that, no matter where an explosion or a fire might occur, it should be possible for anyone in the vicinity to escape quickly and easily. It follows that if the danger blocks one exit route, a second route should always be available.

The provision of access ways within the substation has been covered in the previous sections and it remains to discuss the type, construction and situation of escape doors (see Fig. 2).

All panic doors should open outwards, away from the source of danger, either by pushing on the door itself or

on a panic bar. Sliding doors may prove difficult to open in an emergency and there is a tendency, therefore, for them to be wedged in the "open" position when men are working in the substation. Notwithstanding the fact that it cannot be claimed to be completely fireproof, there is much to commend the use of the swing-through type of door with a spring return to the central position. This type of door is particularly applicable for use between switch rooms. Where the doorway has to be sufficiently wide to pass large switchgear units, a double-leaf door is preferable to a large single door. In such locations, both leaves should be of the swing-through pattern, but the leaf nearest the switchgear should be pivot-hung only, i.e. without a spring return, and should be fitted with shoot bolts at the top and bottom. The other leaf should be fitted with spring return and appropriately labelled. With regard to the labelling of doors, it is felt that all emergency exits should be clearly marked in distinctive standard colours, e.g. the doors to be painted bright red with "Emergency Exit—Push" clearly stencilled in white lettering.

Doors between switch-houses must be capable of resisting the effects of fire from both sides and, therefore, should be of steel or other non-combustible material. As lightness in weight, consistent with adequate fireproofing, is an important factor, a hollow-pressed steel construction with slag or glass wool filling in the core is to be preferred to solid steel plate.

External doors, in general, will not be subject to external fire hazards and may, therefore, be wooden-framed with a non-combustible plating on the inside face.

Cable Access

Whereas cable trenches have for many years been a normal feature in substation design, it is felt that there are so many disadvantages associated with them that they should be avoided wherever possible. It is well-nigh impossible to keep a cable trench free from water unless great attention is paid to the sealing of each cable entry and the trench itself is "tanked" with an external asphalt skin; the trench tends to collect dirt and refuse and must be covered by metallic trench covers capable at least of supporting the weight of a man. Cable trenches are not easily sealed against the entry of oil and therefore should be protected by an extension of the CO_2 installation. This brings an additional difficulty in its train as the CO_2 being heavier than air collects in the trench following an operation of the installation and is not easily removed.

All these disadvantages can be eliminated by the use of earthenware or fibre cable pipes or ducts built into the floor of the substation. The "Ductube" system employing inflatable rubber cylinders around which the concrete is cast *in situ* has been successfully used as an alternative to the pipe. Although the preliminary work of setting up the "Ductubes" may take somewhat longer, the exact radiusing of the cables and the omission of socketed pipe joints has been found very beneficial especially in those cases necessitating several cables per phase. Whereas the duct orifices can be placed immediately beneath the cable glands, the greatly increased flexibility of the "Ductubes" will allow the cables to be returned to the trefoil grouping in a comparatively short distance. The use of models in the drawing office in the setting out of the "Ductubes" and their supporting structure is likely to simplify the site work quite considerably (see Fig. 3).

When earthenware or fibre pipes are used, they are terminated slightly above the finished floor level to avoid the ingress of oil and this arrangement allows the easy fireproofing of the cable terminations.

The use of cable pipes has been greatly facilitated by the introduction of cable box designs permitting the cable or cables to be laid into the box without having to thread them through a hole in the base of the box. This design necessitates a removable cover plate and removable gland plate, the latter being threaded over the cable. The design also necessitates the provision of two gaskets meeting at right-angles and whilst this feature may on first sight appear to be undesirable, in practice the joint has proved perfectly adequate over a considerable number of years. Again the use of pipes or ducts requires the cable gland to be at least 4ft 6in above floor level to allow S.L. type cables to be broken out of trefoil. The use of "Ductubes" as suggested earlier will allow some reduction in this dimension.

Multi-Core Cables

Multi-core cables may be run in shallow trenches, cleated to walls or run in steel trunking. In the last two cases, arrangements can be made for the cables to enter through the top of control cubicles. It is considered, however, that the shallow trench is a tidier method and as the width of the trench can be kept small, it is possible to use a much lighter type of trench cover. After experimenting with a variety of materials, including resin-bonded glass fibre and plastic laminates, an aluminium alloy plate with a non-slip tread has been found to be very suitable.

Fig. 3.—Use of "Ductube" for forming incoming cable ducts

For trenches not exceeding 2ft 6in in width, a $\frac{1}{4}$in thick plate which, with the superimposed non-slip tread gives an overall thickness of $\frac{5}{16}$in, is recommended. The weight of this thickness of plate is 3·71 lb per sq ft, and plates 4ft long and 2ft 6in wide can be conveniently handled by one man. Again, due to its lightness, there would appear to be far less chance of damage to multi-core cables if a plate is accidentally dropped into the trench than with concrete or steel chequer plate covers.

Control cubicles may be installed over the multi-core trench or immediately in front of it. If the former method is adopted, difficulty is experienced when modifications to the cabling are required or when a multi-core cable fault occurs. In the latter method, it is necessary to provide

short stub trenches for each cubicle. This is a comparatively expensive process requiring extra formwork and extra drawing office work. Moreover, it is difficult to provide for future extensions when, say, the unit centre dimensions are unknown.

A method which has very definite advantages over both of the foregoing is shown in Fig. 1. A double width trench is provided which is divided into two at floor level by a longitudinal concrete beam. The cubicles are mounted over the front slot, the rear one, under which the multi-cores are laid, being covered by aluminium alloy plates. Free access to each individual cubicle is thus available. Dependent on its overall length the concrete beam may be supported at intervals on short brick pillars.

There would appear to be little justification in this type of substation for the semi-corridor type of control board with the multi-core cable glands in the rear portion, connections to the control board proper being carried overhead in troughing. Also the full corridor type with relays on the rear portion and control equipment on the front portion, is not recommended.

Transformers

Unless there is a serious noise problem to be overcome, large transformers should be installed outdoors and most transformers are now designed to this end. Even if noise screening is required and the transformer has to be housed, the cooler bank will remain outside.

There has been a tendency in the past to overcomplicate transformer foundations in order to provide for loss of oil in large quantities from the transformer. Such foundations have been in the form of a concrete pit filled with graded pebbles (presumably intended to cool the oil below the flash point) with pipes to a sump from which the oil may be recovered. Quite apart from the high cost of such an arrangement, the main difficulty is preventing the sump from becoming filled with rainwater, leaving no room in emergency for oil.

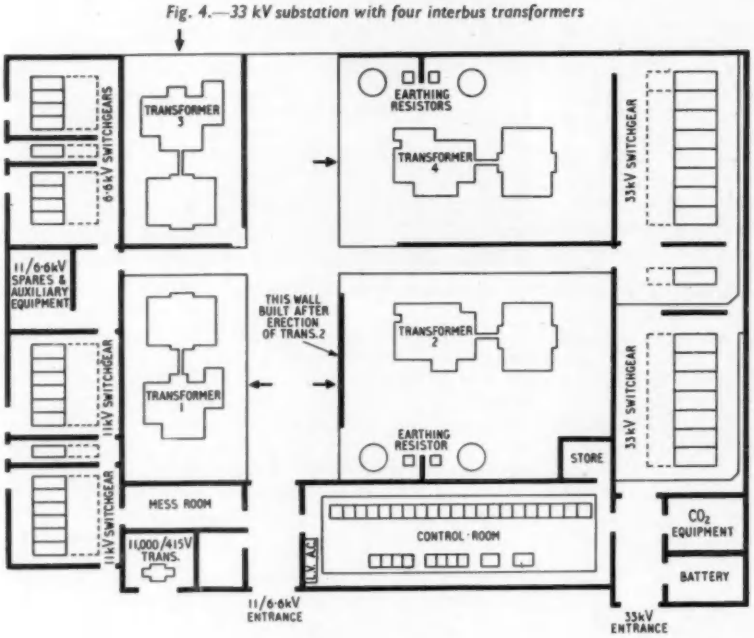
Experience, at least over the past ten years, indicates that a much simpler arrangement is adequate. The transformer is mounted on a reinforced concrete raft, which, unless the load-bearing qualities of the soil necessitate a greater spread of load, should be approximately 1ft larger in length and width than the base of the transformer. The top surface of the raft should be about 6in above the ground. The transformer cooler, if separate from the transformer, is supported on four individual concrete blocks. The ground immediately surrounding the raft is excavated to a depth of 6in and backfilled with 3in of fine ash followed by a top surface of 3in of coarse gravel or chippings. This backfill will absorb normal surface water and small oil leaks. To protect against mass loss of oil, a dwarf wall is erected round the transformer sufficiently high to contain all the oil from the transformer and cooler after making allowance for the quantity to be absorbed by the ash and chippings. This wall should be a reasonable distance from the transformer to ensure that oil is not thrown over it following an explosion.

From available information, possibly because transformer fires and explosions are fortunately very rare, it is difficult to assess the danger in installing transformers in close proximity. There is a risk that a fire on one transformer may be spread to an adjacent unit by burning oil being thrown and probably a still greater risk that an explosion in a transformer cable box may throw metal fragments which will puncture the oil cooler fins. A barrier wall, erected to a height of not less than that of the conservator, should be provided between adjacent transformers if the distance between them is less than, say, 15 yd. This proximity risk must be taken into account when one transformer is installed on each side of a common access road.

Interior Walls of Switch Houses

In order to economise in initial capital cost and subsequent maintenance, plaster rendering with some form of paint finish can be dispensed with on the interior walls. Second quality engineering bricks have been tried, but it seems impossible to eradicate the white efflorescence or " salting " of the fired bricks. The happiest solution has been found in the use of the lime-sand bricks which are off-white in colour and give a clean, light appearance to a switch-house (see Fig. 1). An equally successful finish to the switch-house floor has not yet been found and the reinforced concrete floor with a granolithic top surface finally treated with an anti-dust solution is still retained.

Fig. 4.—33 kV substation with four interbus transformers



Some Examples

Having examined various trends in the detail of substation design, it may be of interest to note how they have been incorporated in a number of 33 kV substations which have been erected during the past ten years or are now in course of erection.

Fig. 2 shows a 33 kV switching station with an input from two 45 MVA 132/33 kV transformers and illustrates a design in which the switch-house and the control room are arranged back to back with a common wall between them. Provision is made for main cable access to be either

from the front or rear of the building through ducts. The back of the switchgear is against the dividing wall and, as the multi-core cable boxes are situated at the back of the switchgear, it is possible to take the multi-core cables direct into the control room and thus avoid a trench in the switch-house.

A single entrance gives immediate access to the CO_2 room, battery room and toilet accommodation and straightforward, though individual, access to the control room and switch-house.

Adequate escape doors are provided, those at the rear of the switchgear leading from the bus section unit to either of the main sections. The switchgear might equally as well have been reversed in which case the escape doors would have been arranged to open directly to the outside.

The second example, Fig. 4, is a more comprehensive substation designed to accommodate 33 kV, 11 kV and 6·6 kV switchgear with four interbus transformers. An access road for the transformers is approached from the rear of the substation whilst the control room and ancillary rooms screen the transformers from the public highway. It has been necessary to provide two entrances, one to the 33 kV switch-house and the second to the 11 and 6·6 kV switch-houses, but it will be noted that both entrances open into the control room.

In both the foregoing designs, the location of the CO_2 room allows a straight run for the fusible link lines in the 33 kV switch-house.

Finally, Fig. 5 illustrates a 33 kV/11 kV substation having two interbus transformers. This layout is suitable for a through site where, for example, the incoming 33 kV feeders consist of overhead lines approaching from the rear. So far as the disposition of the principal equipment is concerned, the arrangement is ideal as the 33 kV switchgear, transformers and 11 kV switchgear lie in schematic diagram formation, with the control room forming a connecting link. The layout has the disadvantages that the transformers are only partially screened from view and noise problems might arise where there is adjacent private property, and the provision of two access roads adds quite considerably to the overall cost.

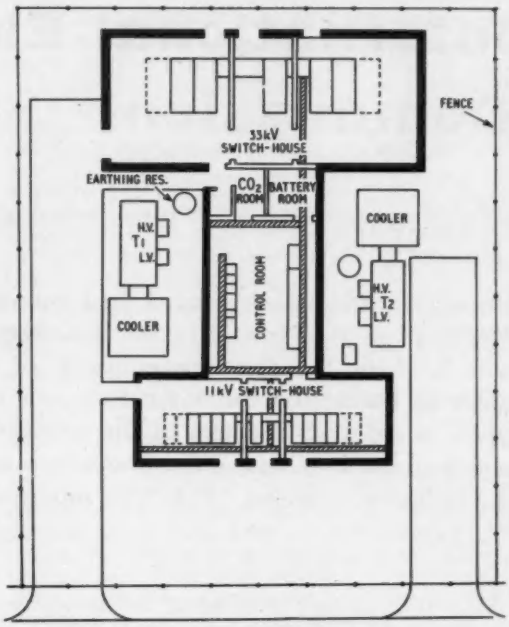


Fig. 5.—Substation with 33 kV and 11/6·6 kV switchgear

Anglo-Swedish Telephone Cable

New Link Planned for Completion in 1960

CONTRACTS have recently been placed with British manufacturers for a new submarine cable system costing about £1½ million. It will be laid between the United Kingdom and Sweden. The new cable, which will be about 530 nautical miles long, will have a capacity of 60 telephone circuits and will provide relief for the Anglo-Dutch cables over which most of the United Kingdom-Sweden telephone traffic at present passes. At the same time it will provide a direct and more economic routing for the growing volume of telephone and telex traffic between the United Kingdom and Sweden, and via Sweden to Finland. The system is expected to be ready for service in October, 1960.

The terminals of the submarine cable system will be at Goteborg and Middlesbrough and 12-circuit groups will be extended, without demodulation to audio frequency, to Stockholm and London. This will provide circuits about 1,100 miles long between the capital cities. Conventional methods of signalling will be employed on the circuits and four-wire switching facilities will be installed in London so that the circuits can be extended to Europe or North America without incurring any additional overall attenuation.

The submarine cable will use some 28 of the new long distance submerged repeaters designed for use with 0·99in diameter lightweight polythene dielectric coaxial cable. As a result it has been necessary to develop a new type of cable which differs from the conventional 0·62in diameter cable. The centre conductor is a core of mild-steel strands over which is placed a copper tape, instead of being of solid copper. The submarine cable will be extended to the terminal stations at each end by about nine miles of land cable. This will be of similar construction to the submarine cable except that it will have soft iron tapes added as a screen against electrical interference.

The new repeaters, which will be spliced into the cable about every 18 n.m. along its length and will amplify signals in both directions, differ in a number of respects from those used on the Newfoundland-Nova Scotia section of the transatlantic telephone cable system. In particular, a new type of valve will be employed which will reduce the voltage per repeater from 123 to 75 V. Also the repeaters will incorporate a new supervisory system which will enable measurements of loop gain, noise and intermodulation products to be made for each repeater without taking the system out of commission. Power feeding and control of the supervisory system will be from the Middlesbrough station.

H.M.T.S. *Monarch* will be used to lay the cable and repeaters and the overall testing and lining-up of the system will be the joint responsibility of the General Post Office and the Royal Swedish Board of Telecommunications. The British contractors concerned are Standard Telephones & Cables, Ltd., for the repeaters, submarine cable and the repeater supervisory and terminal equipment; the Telegraph Construction & Maintenance Co., Ltd., for the land cable; and the Westinghouse Brake & Signal Co., Ltd., for the submerged repeater power feeding equipment.

International Electrotechnical Commission

FROM A SPECIAL CORRESPONDENT

PROCEEDINGS OF THE 1958 MEETINGS IN STOCKHOLM

During a three-week period last month the 1958 Grouped Meeting of the International Electrotechnical Commission was held in Sweden, the majority of the meetings taking place in Stockholm. In this article, our special correspondent gives a detailed account of the proceedings at the Council meeting, the meetings of the Committee of Action and some of the technical sessions. A further report will appear next week.

THE 1958 Grouped Meeting of the International Electrotechnical Commission broke several records. It was spread over a period of three weeks (30th June to 17th July) instead of the usual fortnight; the number of committees holding meetings was over fifty, an even larger number than on the occasion of the jubilee meeting in Philadelphia; and the number of delegates (about 1,000) was the "highest ever"; and finally, as a direct consequence of the foregoing factors, the meetings were held in four different towns instead of being centralised at one location.

The majority of the meetings were held in Stockholm during the period 8th to 17th July, but to ease the acute problem of hotel accommodation some were held during the previous week in the Swedish provincial towns of Vasteras and Ludvika, where ASEA (the Swedish General Electric Co.) acted as hosts. Even this amount of decentralisation did not enable adequate facilities to be provided for all the committees, and the Danish National Committee therefore acted as host to three committees in Copenhagen during the period 30th June to 4th July.

The whole of the arrangements for the meetings (and associated social functions) in Sweden were most efficiently made by the Swedish Electrotechnical Committee, with the active collaboration of the Swedish Standards Association, and the meetings in Stockholm were held in the pleasant and very appropriate surroundings of the Royal Institute of Technology. The meetings in Vasteras were held at the ASEA Club, and those at Ludvika took place at a delightful hotel on the shore of Lake Bysjon. The Copenhagen meetings, the arrangements for which were in the capable hands of the Danish Electrotechnical Committee, were at the headquarters of the Students' Association.

The Council of the I.E.C. normally meets every three years, and a meeting was held in Stockholm on 17th July. The Committee of Action (which in effect acts as the Executive Committee of the Council) held two meetings, and of the 54 technical committees and sub-committees in the programme, 11 met in Vasteras, three in Ludvika and three in Copenhagen. The remainder met in Stockholm. Some committees held only a one-day session while others sat for as long as a full week. As usual, the largest delegation, apart from that from the host country, was the United Kingdom delegation, numbering 126. Other large delegations were those from Germany (105), France (94), U.S.A. (63), Switzerland (60), Netherlands (57), Italy (52) and U.S.S.R. (37). In all, 28 countries were represented.

Council Meeting

The Council consists of representatives of all the National Committees of the I.E.C. They are normally represented through their chairmen who may be accompanied by one or two advisers. At the meeting in Stockholm 24 countries were represented. The first part of the meeting was under the chairmanship of Dr. P. Dunsheath, the retiring president. Dr. Dunsheath recalled that since the last meeting of the Council four new countries had applied for membership of the I.E.C., namely, Bulgaria, the People's Republic of China, Roumania and Turkey. The appointment of the appropriate bodies as the National Committees of these four countries was confirmed.

The Council passed a resolution formally endorsing all the decisions taken by the Committee of Action since the last meeting of the Council three years ago. These decisions are recorded in the minutes of the meetings of the Committee of Action held in Munich (1956) and Moscow (1957). The Council also passed a resolution (submitted by the Committee of Action) authorising the treasurer to obtain the grant of a bank overdraft, to be limited in value and term as decided by the Committee of Action.

It was agreed that a special meeting of the Council should be convened during the 1959 General Meeting, to consider a proposal that the contributions from the National Committees should be increased. This arose out of a warning given by the treasurer that expenditure was overtaking income, and is referred to below in the notes on the meeting of the Committee of Action.

Only one nomination had been received for the position of the president for the next three-year term, namely that of Dr. I. Herlitz, chief electrical engineer of ASEA. Dr. Dunsheath paid tribute to Dr. Herlitz's contributions to electrical science and technology, and prophesied that in

the course of years to come Dr. Herlitz would be equally well known in outer space! Dr. Herlitz then took the chair amid acclamation, and he paid tribute to the work of Dr. Dunsheath, first as treasurer and then as president. Mr. A. W. Roth (Switzerland) was re-elected treasurer for a further three years. The Council then proceeded to the election of three members of the Committee of Action to take the place of Belgium, Italy and the United Kingdom, who were due to retire, having served for a term of nine years. After a ballot had been taken, Spain, the U.S.A. and the U.S.S.R. were declared elected.

Committee of Action

The Committee of Action met on 10th July under the chairmanship of Dr. Dunsheath and on 17th July under the chairmanship of Dr. Herlitz. At the opening of the first meeting Dr. Dunsheath referred to the losses suffered by the I.E.C. during the past 12 months through the deaths of Mr. Brylinski (France), hon. president; Prof. Lombardi (Italy), a former president; Mr. J. H. C. Spinks (U.K.), chairman of the technical committee on rotating machinery; Dr. Comfort-Adams, a former president of the U.S. National Committee and one of the founders of the I.E.C.; Mr. R. W. W. Sanderson (U.K.), chairman of the committee on batteries; and others.

Mr. L. Ruppert, general secretary, presented his annual report, and referred to the fact that since the Central Office moved from London to Geneva ten years ago the work had increased steadily, if not alarmingly. In 1948, 200 documents were issued, whereas during the first six months of 1958 over 1,000 documents had been circulated. Efforts had been made to cut down the circulation of documents by setting up small working groups rather than sub-committees, but this had not achieved the expected economy in paper, since all National Committees asked for copies of practically every document. The work of the I.E.C. was of interest to several international organisations, and the Central Office was in close contact with the Secretariats of these other organisations, many of which had their headquarters in Geneva. Mr. Ruppert then drew attention to the increase in the number of publications produced; nine had been issued in 1956-57, 21 in 1957-58, and it was expected that 30 would be issued in 1958-59. The first publication to be issued in an English/Russian edition (in accordance with the policy agreed upon last year) would soon become available.

Finance. The treasurer presented the accounts for the year 1957, which showed that the expenses had been kept within the budget figure of 370,000 Swiss francs. There was, in fact, an excess of income over expenditure amounting to 30,000 fr. This was the first time for some years that there had been such an excess, and this was due to the fact that the subscriptions from the National Committees had been increased two years ago. The budget for 1958-59 provided for an expenditure of approximately 508,000 fr. Mr. Roth exhibited a curve showing the rate of expenditure, and he pointed out that it was doubling every four years, this increase being much faster than the increase in the consumption of electricity. In view of the amount of capital invested in stocks of publications it might become necessary to obtain a bank overdraft, and he sought (and was given) authority from the Committee of Action to obtain an overdraft of 100,000 fr. for a period of three years.

Mr. Roth added that he did not wish to propose an immediate increase in subscriptions to cover the increasing expenditure, nor could he contemplate any slowing down in activity in order to keep within the present income. He gave a warning, however, that it would not be possible to present a balanced budget for the period 1960-62 unless subscriptions were increased. Present indications were that an increase of the order of 33⅓ per cent would be necessary.

The treasurer's statement gave rise to some discussion, and several delegates expressed the view that it would be better to raise the subscriptions in good time rather than have recourse to an overdraft. It was pointed out that any increase in subscriptions would have to be authorised by the Council after consultation with the National Committees, and this would necessarily take some time. It was therefore agreed to recommend to the Council that a special meeting should be held in 1959 to initiate the necessary action.

Le Maistre Memorial Lecture. The president announced that he had invited Mr. A. N. Nekrasov, president of the U.S.S.R. National Committee, to deliver the lecture in 1959.

Future Meetings. It was confirmed that the Grouped Meeting in 1959 would take place in Madrid from 30th June to 10th July, and that the meeting in 1960 would be held in New Delhi in September or October.

The Committee of Action noted with concern the organisational difficulties both for the Central Office and the host country, arising out of the tendency for the number of committees participating in the Grouped Meetings to increase year by year. It was therefore agreed that the Central Office, after consulting the various Secretariats of technical committees, would prepare a list of the committees which had asked to meet during the period of the Grouped Meetings. This list would be submitted to the President's Preparatory Committee not later than six months before the date of the Grouped Meetings, and a decision would be taken by the P.P.C. as to which requests should be accepted. In this way it was hoped that the annual Grouped Meetings could be restricted to a maximum of about 25 technical committees and sub-committees, involving the attendance of approximately 600 delegates. In addition to annual Grouped Meetings, individual meetings of technical committees would be arranged at other times of the year in different countries. This is, of course, in accordance with present practice, but it was hoped that positive steps could be taken to arrange a more even distribution of meetings throughout the year, so as to lessen the load falling on the Central Office and the host countries. It was further agreed that the National Committees should be asked to consider some measure of selection in forming their delegations so as to keep the number of delegates down to workable proportions. Incidentally, the need for some such action will be obvious from the fact that the Central Office has already received requests for meetings of 47 committees in Madrid next year. Some pruning will be essential.

Appointment of Chairmen of Technical Committees. Amongst the new chairmen of Technical Committees appointed by the Committee of Action are the following: Mr. L. W. James (Central Electricity Generating Board) to be chairman of the technical committee on rotating machinery, in succession to the late Mr. J. H. C. Spinks (U.K.); and Mr. F. Aufenast (Ever Ready Co. (Great Britain), Ltd.) to be chairman of the technical committee on dry cells and batteries, in succession to the late Mr. R. W. W. Sanderson (U.K.).

Nuclear Energy. Mr. P. Ailleret (France) presented a report on behalf of a working group on nuclear energy, set up by the Committee of Action at their meeting in Moscow. This group was in close liaison with the secretariat of the International Organisation for Standardisation (I.S.O.) technical committee on nuclear energy. Special consideration had been given to the co-ordination of the

work of the I.E.C. and the I.S.O. in the field of terminology, and an agreed procedure had been established. In this connection it was reported that two new chapters were being introduced into the International Electrotechnical Vocabulary, the second edition of which was at present in preparation. These two new chapters would deal with nuclear power plant and with the detection and measurement of nuclear radiation, respectively. It was also reported that the I.E.C. technical committee on insulating materials had set up a working group to study the influence of radiation on insulating materials. Eleven countries were participating in the work of this group.

The Committee of Action authorised the setting-up of a new technical committee to deal with the electrical measuring instruments used in the application of radioisotopes and personal protection. The Secretariat for this new committee was assigned to Germany.

Photographic Projection Lamps. Consideration was given to the proposal, made at the Moscow meeting of the technical committee on electric lamps, that a coding system for photographic projection lamps, based on the scheme administered by the American Standards Association, should be recognised by the I.E.C. and administered on an international scale. For the purposes of administration one of the National Committees would act as the registration authority, and the proposal was that the American Standards Association should be designated as the authority. The scheme was largely commercial in nature rather than technical, as the payment of fees to the registration authority would be involved, and for that reason the Committee of Action had been asked to give a ruling as to whether the administration of such a scheme was an appropriate I.E.C. activity.

The Committee of Action accepted a recommendation from the President's Preparatory Committee that there was no objection in principle to the proposal, subject to the technical committee on lamps reaching agreement on the technical and administrative implications. The first step would be the issue by the I.E.C. of a document setting out the basis of the coding scheme.

Co-operation with I.S.O. The second session of the meeting of the Committee of Action was opened by the new president, Dr. Herlitz, who welcomed the attendance of Sir Roger Duncalfe, president of the International Organisation for Standardisation. Sir Roger then addressed the meeting, conveying to the I.E.C. the cordial greetings of the I.S.O. Council. He referred to the fact that the Central Offices of the I.E.C. and I.S.O. were housed in the same building in Geneva, and shared certain office equipment, an arrangement which greatly facilitated the day-to-day collaboration between the two organisations. A particularly interesting example of co-operation was in connection with the work on acoustics. Both the I.E.C. and the I.S.O. had committees and these always met at the same place and were so timed that the delegates could attend all the meetings. Furthermore, an I.E.C./I.S.O. Steering Committee on Acoustics had been set up to co-ordinate the work. Other examples quoted by Sir Roger included the co-ordination of the standard conditions (temperature, humidity and pressure) for the testing of materials, and work on the problems associated with sound recording on film. Sir Roger advocated the formation of joint I.E.C./I.S.O. Committees as a further step in avoiding duplication of work by the two organisations on problems of common interest.

Regulations for Overhead Lines. Several years ago the I.E.C. published a comparison of the overhead line regulations in force in different countries. At the Stockholm meeting of the Committee of Action consideration was given to a proposal by the Roumanian National Committee that this comparison should be brought up to date and that actual standards should be formulated for the erection of lines. The Committee of Action felt that, as overhead line regulations were the responsibility of government departments, the I.E.C. was not the appropriate body to deal with the matter. Furthermore, much of the work proposed by Roumania was within the province of C.I.G.R.E. It was therefore decided to disband the former I.E.C. Committee on Overhead Line Regulations.

Safety Requirements for Electrical Equipment. It was recalled that a special sub-committee had been set up by the Committee of Action two years ago to co-ordinate the work of the various technical committees in so far as safety requirements were concerned. This sub-committee had formulated some notes for the guidance of the technical committees on the kind of clauses that should, wherever practicable, be introduced into I.E.C. specifications. Mr. H. A. R. Binney (U.K.), chairman of the sub-committee, reported that it was hoped to be able eventually to issue a general safety code, and in preparation for this the Secretariat (Germany) was doing some exploratory work. A memorandum, setting forth the safety clauses already embodied in I.E.C. publications, would be ready for review by the sub-committee in the near future.

The sub-committee was asked to give consideration to a proposal by Denmark that work should be undertaken by a special committee on terms, definitions and corresponding methods of test for protective enclosures. Work of this sort was already being done in several different committees dealing with various types of equipment, and some measure of co-ordination appeared to be desirable. The Danish proposal pointed out that the subject should be tackled from two aspects, namely, the safety of persons using the equipment which is within the enclosure, and the protection of the equipment itself against external influences (moisture, dust, etc.).

In undertaking to consider the Danish proposal, Mr. Binney pointed out that his sub-committee was not competent to go into full technical detail, but they would review the matter within the general field of co-ordination which was their prime function.

Conductors for Electronic Equipment. It was agreed, on the recommendation of the technical committee on electronic components, that the National Committees should be consulted regarding a proposal to set up a new technical committee on cables, wires and waveguides peculiar to electronic equipment. It was stressed that, in the event of such a committee being set up, very close collaboration would have to be maintained with the International Telecommunications Union.

Work of the Technical Committees

As already indicated, over fifty committees held meetings and it is not practicable to report on the work of each individual committee. In the following notes, however, the subjects discussed are grouped under the headings of the main Technical Committees, some of which have several sub-committees or working groups. Unless otherwise stated the meetings were held in Stockholm.

The Six Months' Rule, which is repeatedly mentioned in these notes, represents the procedure for obtaining approval to the publication of an I.E.C. document. When the document has been thoroughly discussed by a technical committee, after review by the National Committees, it is recirculated for approval, and the National Committees

are asked to vote (by post) for or against the document within a time limit of six months. If the votes show a four-fifths majority in favour, the chairman of the technical committee is empowered to declare that the document is approved for publication without technical modification. If, however, the votes are accompanied by comments, the chairman may propose modifications to the document if by doing so he thinks the acceptability of the document will be increased. In that event the chairman's proposed modifications are circulated to the National Committees for approval under the **Two Months' Procedure,** which means that within a time limit of two months the National Committees must indicate whether they accept the proposed modifications, whether they prefer the original document, or whether they reaffirm their negative vote on the original document.

Technical Committee No. 1, Nomenclature. This committee has the job of progressing and co-ordinating the work of the various Experts Committees dealing with individual chapters of the International Electrotechnical Vocabulary, the second edition of which is well advanced. About a dozen of the twenty chapters have already been, or are about to be, published and the work is expected to be completed by 1960. The final stage will be the compilation of a complete alphabetical index in the two official languages (English and French) and the five auxiliary languages (German, Italian, Polish, Spanish and Swedish). It appeared that it would not be practicable to include the Russian terms in the index for the second edition, but this would be done for the third edition. Prof. de Artigas (Spain) said his National Committee, which had so far not participated very actively in the drafting of definitions, would be prepared to undertake the preparation of the index. This offer was gratefully accepted.

Looking ahead to the time, some three years hence, when work on the third edition of the Vocabulary would be started, the list of chapters was slightly rearranged and extended, and some changes were made in a few instances regarding the countries to be asked to assume Secretariat responsibilities for the various chapters, the object being to spread the load of work more evenly amongst the National Committees. The United Kingdom will retain responsibility for the chapters on telecommunications, and the three separate chapters on the second edition (not yet published) will be combined into a single chapter, suitably sub-divided, for the third edition.

Contrary to the general rule that I.E.C. publications shall in future be issued in two separate editions, English/French and English/Russian, it is hoped to be able to include all three languages in the same volume for the third edition of the Vocabulary.

The Secretariats of other technical committees are to be reminded of the importance of maintaining close liaison with the Secretariat of TC/1 and of sending to the latter any proposals for terms and definitions which arise out of the work of these other committees.

Technical Committee No. 2, Rotating Machinery. The only meeting under this heading was of a sub-committee on carbon brushes. There is conflicting practice in various countries regarding the use of the terms "width" and "length," and in an endeavour to overcome this it is now proposed that the dimensions of brushes should be referred to as the tangential, axial and radial dimensions, and should be stated in that order. It was agreed that two series of sizes would have to be standardised, one in inches and the other in metric units, and two tables were drawn up for the consideration of the National Committees. Tolerances were also discussed and a proposal was provisionally agreed. Future work of this sub-committee will cover flexibles, terminals and other brush details.

Technical Committee No. 3, Graphical Symbols. Since the main committee last met, in 1955, work of a preparatory nature has been actively pursued by the Secretariat with the assistance of an Experts Sub-committee. The results of this work were reviewed in Stockholm and considerable progress was made. As a consequence, lists of symbols for the following items were agreed for circulation under the six months' rule:— Valves, tubes and rectifiers; switches; measuring instruments; transmission lines and accessories; magnetic transductors; batteries and accumulators.

The chairman reported that, as a result of the voting under the six months' rule, he had declared that a list of symbols for resistances, windings, machines and transformers had been approved for publication. The work still continuing includes symbols for generating stations and substations.

Technical Committee No. 7, Aluminium. This committee has been in existence for very many years, but has hitherto never reached any final conclusions. Provisional agreements reached at one meeting have been modified at subsequent meetings. This state of affairs applies particularly to the draft specification for commercial hard-drawn aluminium wire for electrical conductors. This draft was actually approved for publication last year, although it was known that a few National Committees were not entirely satisfied with the draft, but at the Stockholm meeting a further modification was proposed as regards the value of resistivity, and a revised value, 2·8264 microhm cm, will now be circulated for approval under the two months' procedure. It is confidently expected that this modification will result in the withdrawal of all reservations previously made by some National Committees.

Another draft specification, which has been the subject of considerable discussion, is that relating to galvanised steel wires for steel-cored aluminium conductors. Two types of steel wire are in use, namely, wire galvanised after drawing and wire drawn after galvanising. Some countries use only one type while others desire freedom to use either type. After agreement had been reached last year on the technical requirements for the two types the draft specification was circulated for approval under the six months' rule. The voting showed only a small majority in favour of the draft, and the matter was therefore re-opened at the Stockholm meeting. Many of the comments submitted by the National Committees with their votes concerned the question whether the choice of the type of steel wire to be used for a particular contract should be at the discretion of the purchaser or of the conductor manufacturer. An amended draft will now be circulated under the two months' procedure.

The question of galvanised steel wires for use in steel-cored aluminium alloy conductors is still under consideration. The characteristics of aluminium alloy of the Al-Mg-Si type for busbars are now agreed for circulation under the six months' rule. The same position has been reached regarding the characteristics of annealed commercial aluminium wires larger than 1 mm diameter. Wires of other tempers are still under consideration. It was decided that at this stage it was not practicable, or indeed commercially necessary, to establish a value for the resistivity of super-pure aluminium wire. The committee has not so far dealt with specifications for complete aluminium conductors for overhead lines, but this subject has now been included in the programme of future work.

Technical Committee No. 8, Voltages, Current Ratings and Frequencies. The work of this committee has

hitherto been concerned mainly with a.c. system voltages and the committee's recommendations were issued a year or two ago as a revision of I.E.C. Publication 38. Some further revisions of the document were under discussion in Stockholm. In this connection the U.K. delegation put up some proposals relating to high-voltage d.c. transmission. Some other delegations considered that work on this subject was premature, while others pointed out that as the voltages proposed ranged from 100 kV to 800 kV the subject overlapped with the scope of Technical Committee No. 30 which was responsible for making recommendations regarding voltages from 420 kV upwards. It was finally agreed that, as soon as it was practicable for voltage steps to be standardised, the work on high-voltage d.c. systems should be dealt with by only one committee for the whole range. On the matter being brought to the attention of the Committee of Action it was decided to refer this work to TC/30, High Voltages. A list of frequencies to be standardised for various applications was agreed for circulation under the six months' rule.

A proposal submitted by France that an international investigation should be initiated by the I.E.C. on the subject of the actual voltages obtained on systems during operation was not taken up, but interest in the investigations at present going on in France was expressed and the results will probably be reviewed by the I.E.C. Committee in due course.

Technical Committee No. 12, Radio Communication. The main committee held a meeting in Paris last April, and in its report, presented to the Committee of Action in Stockholm, it requested authority (which was given) for the publication of two documents dealing with radiation measurements on a.m., f.m. and TV receivers, and methods of measurement of performance characteristics of TV receivers respectively. Work is now being started on the climatic testing of telecommunication equipment, this being, in effect, an extension of the work already done on the climatic testing of components.

A meeting of the sub-committee on safety requirements was held in Copenhagen, when consideration was given to a request from the main committee that the sub-committee should extend its activities to cover safety rules for transmitters as well as for receivers. The sub-committee came to the conclusion that, as at present constituted, it had neither the technical experience nor the time to enable it to accept this proposed extension of its work, and the main committee was asked to reconsider the matter. In the meantime the sub-committee is proceeding with the revision of I.E.C. Publication 65, safety rules for radio (including TV) receivers and associated equipment. Some proposals which are to be issued as an amendment to the first edition, in advance of the completion of the second edition, were agreed for circulation under the two months' procedure.

Technical Committee No. 13, Measuring Instruments. The main committee received reports from its three sub-committees, all of which met in Stockholm. Sub-committee 13A, Integrating Meters, reviewed the comments submitted by some National Committees with their votes on the approval of a draft specification for watt-hour meters. Five countries had voted against the acceptance of the specification and the sub-committee therefore made amendments to the draft in the hope of meeting the objections. The proposed amendments will be circulated under the two months' procedure.

A draft specification for reactive watt-hour meters was completed by Sub-committee 13A for circulation to the National Committees for comment. Future work of the sub-committee covers Class 1·0 watt-hour meters and Class 2·0 VAr meters. Sub-committee 13B, Indicating Instruments, discussed a few comments submitted by some National Committees on the draft specification for indicating instruments which had been circulated under the six months' rule. It was found that the points raised in these comments could be met by certain editorial changes, and it was therefore agreed that the draft specification should go ahead for publication after attention by an editing committee.

The first draft of a specification for recording instruments was discussed, and it was decided to restrict the scope to low-speed direct-writing recorders the question of contact recorders being left for future consideration. The Secretariat will now prepare a revised draft for discussion at the next meeting. A working group, to draft proposals for terminal markings for indicating instruments, was set up.

Sub-committee 13C, Electronic Measuring Instruments, held its first meeting and decided that its scope would have to be delimited more precisely, the field of electronic measuring instruments being too wide to be embraced by a single sub-committee. For the time being the sub-committee will confine its attention to signal generators, a draft specification for which had been prepared by the Secretariat. This draft was referred to a working group for more detailed examination than was possible at the meeting in Stockholm.

Technical Committee No. 14, Power Transformers. This committee, for which the B.S.I. acts as Secretariat, met for the first time since 1951, when the first edition of the I.E.C. specification for power transformers was agreed in principle and referred to a drafting committee. The specification was eventually issued in 1955 as Publication 76, and the Secretariat almost immediately started preparations for a second edition. Numerous proposals were received from the National Committees, and these were considered in Stockholm. Good progress was made, but several matters were found to require study in considerable detail and four working groups were set up to deal with them. A sub-committee was also set up to draft proposals for on-load tap-changers, a subject on which much work has already been done by C.I.G.R.E. Liaison has been established with that body and two reports issued by C.I.G.R.E. will form the starting point for the I.E.C. work.

(To be concluded)

Coal and the Consumer

THE eleventh annual reports of the Industrial and Domestic Coal Consumers' Councils for the year ended 30th June, 1958, were signed and submitted to the Minister of Power before the actual decontrol of house coal and the announcement of the ending of coal allocations to industry.

Although the decline in the proportion of large coal to the total has begun to show signs of responding to the National Coal Board's efforts to arrest it, with the ending of imports the availability of this size may be again lower this year. The Industrial Coal Consumers' Council therefore recommend that greater efforts should be made to increase the supply of briquettes, which the railways, in particular, are prepared to take as an alternative. They also "note with interest" the financial and other measures being adopted by the N.C.B. to adjust the balance between the supply and the demand for the different sizes of coal, and they do not consider the exclusion of the railways as "undue or unreasonable" discrimination. The Council also approve in principle the N.C.B.'s intention to give financial advantage to industrial consumers who are prepared to place annual contracts for regular deliveries of equal tonnage.

GENERATION AND DEVELOPMENT

General view of Ledston substation, near Castleford, Yorks

C.E.G.B. Contracts

The Central Electricity Generating Board has placed contracts during the past month for power stations, transmission lines and transforming stations amounting in the aggregate to £6,464,543. They include the following:—

Aberthaw power station: 6·6 kV switchgear and accessories.—South Wales Switchgear.

West Thurrock power station: Foundations for boilers Nos. 1 and 2. —Holloway Bros. (London).

Rugeley power station: 3·3 kV switchgear.—Cooke & Ferguson.

Melksham substation: 275 kV switchgear. — Metropolitan - Vickers Electrical Co.

Melksham-Bramley: 275 kV overhead lines.—J. L. Eve Construction Co.

Rugby-Coventry: 132 kV overhead lines.—Balfour Beatty & Co.

Canterbury substation: 132 kV and 275 kV switchgear.—English Electric Co.

Northfleet West substation: 132 kV and 275 kV switchgear.—English Electric Co.

Iver substation: Two 120 MVA, 275/66 kV transformers.—Crompton Parkinson. Two 120 MVA, 275/132 kV transformers.—English Electric Co.

Exeter substation: 132 kV switchgear.—General Electric Co.

Checkerhouse substation: 132 kV switchgear.—A. Reyrolle & Co.

High Marnham-Staythorpe: 275 kV overhead line. — British Insulated Callender's Construction Co.

Winster substation: Two 60 MVA, 132/33 kV transformers.—Fuller Electric.

Agecroft substation: 132 kV switchgear.—Metropolitan-Vickers Electrical Co.

Carrington - Moss Nook: 132 kV, 33 kV and 11 kV auxiliary cables.—Pirelli-General Cable Works.

Ribble substation: Two 60 MVA, 132/33 kV transformers.—Ferranti.

West Melton substation: Two 180 MVA, 275/132 kV transformers.—British Thomson-Houston Co.

New Y.E.B. Primary Substation

To give general reinforcement to the Yorkshire Electricity Board's 11 kV system in the area and cater for additional colliery demands, a new 66/11 kV primary substation has been built at Ledston, near Castleford. The substation is supplied by a 66 kV overhead line from Ferrybridge "A" power station, while a second line via Bramham Moor and Barwick substations provides a closed ring system.

The two 18,750 kVA, 66/11 kV Ferranti transformers are of the outdoor oil-cooled type. They are fitted with oil-circulating pumps automatically controlled by temperature-sensitive devices to provide an emergency overload rating which gives the substation a firm capacity of 23 MVA. The 66 and 11 kV switchgear and ancillary equipment were supplied by Cooke & Ferguson, Ltd.; the 66 kV gear is of the phase-segregated bulk-oil type. Supervisory control and indication equipment, supplied by Standard Telephones & Cables, Ltd., will enable the substation to be operated by remote control from Leeds.

The substation was switched on by Councillor J. Parker, chairman of Garforth U.D.C., on 29th July. Those attending included Mr. A. Bond, deputy chairman, Y.E.B., and members of the Board (the chairman, Mr. D. Bellamy, was unable to attend owing to indisposition); Mr. A. Roberts, M.P.; Mr. P. Briggs, regional director, Central Electricity Generating Board; and Mr. C. G. Richards, divisional controller, C.E.G.B.

At a luncheon after the opening ceremony, Mr. A. Roberts, M.P. for Normanton, said he wished to allay some fears in the coal industry by declaring that, in his opinion, the traditional type of coal-burning power station would continue to be needed long after 1970, in spite of some forecasts to the contrary. He doubted whether nuclear power stations would provide 15 per cent of electrical power needs by 1965, as had been expected, and he considered Britain's indigenous fuels should be utilised to the full.

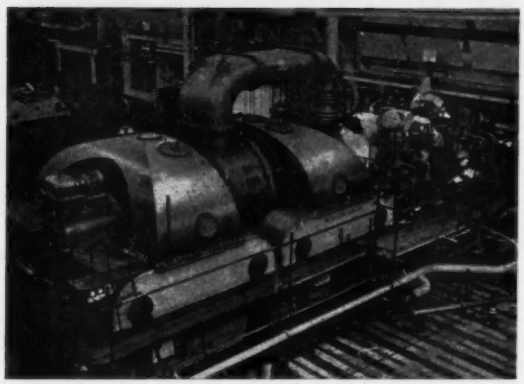
All-Electric Dwellings Replace Slums

The completion of the first 96 dwellings in a £13 million scheme for the clearance and rebuilding of the Hutchesontown-Gorbals area of Glasgow is reported in the *Municipal Journal*. The new dwellings, it says, are all-electric, and have cookers, wash boilers, heated drying cupboards and space for refrigerators. In kitchens, halls and living-rooms electric floor heating is provided. Living-rooms have inset wall panel fires.

Thirty-six four-storey maisonnettes have been built for families. The remaining 60 dwellings are provided in four three-storey blocks. The complete scheme will take 20 years to complete and will include blocks of multi-storey flats.

Hospital Complaint

At a recent meeting of the East Fife Hospitals Board it was reported that there had been a four-hour failure in the electricity supply to Craigtoun Maternity Hospital and that in the winter, during heavy snow, a breakdown had lasted for eight hours. The Electricity Board had intimated that it would cost £1,600 to provide an alternative supply and the House Committee therefore recommended that £200 should be spent on a gas-



This 120 MW turbine undergoing tests at Metropolitan-Vickers Trafford Works, is the first of nine similar sets being supplied to the Central Electricity Generating Board. It will be installed at Blyth "A" power station

fired boiler with heat exchanger. Bailie H. P. Gourlay (Kirkcaldy) said it seemed a pity to go back to old-fashioned methods. He was quite sure the Electricity Board would prefer to have another look at the matter. It was agreed that the secretary should press the Electricity Board for a prompt statement on the position.

Fewer Colliers

A reduction in the Central Electricity Generating Board's collier fleet is planned for the next few years, a Board spokesman said last week. This is due to the advent of nuclear power and the policy of siting power stations near the coalfields. Of the Board's present fleet of about 50, three have already been scrapped and six more are being sold.

Domestic Appliance Sales by Area Boards

The accompanying table shows the number of new appliances sold by Area Electricity Boards in England and Wales for the month of June and for the twelve months ended 30th June, together with percentage changes over corresponding periods of the previous year. The sales by Area Boards, of course, represent only a part of total sales throughout the country.

Class of appliance	Sales in June, 1958		Sales in 12 months ended 30th June	
	Total	%change	Total	%change
Cookers	18,935	− 1·5	228,381	+ 4·4
Water Heaters—				
Immersion	22,538	+ 0·6	153,945	+14·3
Storage	4,161	+17·9	43,456	+ 4·5
Wash Boilers	6,580	+ 4·7	79,823	+ 7·8
Washing Machines ...	6,783	+16·3	74,158	+ 5·9
Refrigerators	10,362	+ 3·4	60,524	+61·5

Clarence Dock Smoke Problem

One section of the annual report of the Liverpool medical officer of health, Prof. A. B. Semple, deals with the smoke nuisance caused by the Clarence Dock power station. He states that Ministry of Power engineers and technical officers of the Central Electricity Generating Board are still trying to find a solution to the problem of smoke plume and that further experiments are to be carried out with chemical additives to reduce the sulphur content.

Transport Vehicle Renewal Programme

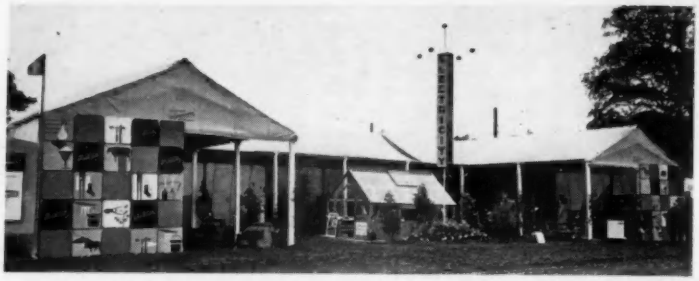
Newcastle-on-Tyne City Council is to spend £1,800,000 on renewing its motor and trolley-buses. Motor-buses will be dealt with first, and in 1965 a five-year trolley-bus replacement plan will be started. It is understood that the trolley-bus renewals will cost a million pounds.

OVERSEAS

Mr. Khrushchev Inaugurates Kuibyshev Scheme

Last Sunday the Russian Prime Minister, Mr. N. Khrushchev, cut a ribbon across the lock gates to commission the Kuibyshev hydro-electric project which has taken seven years to complete. He announced that it was to be called the Lenin-Volga power station. The new station, he said, was an important link in the fulfilment of the electrification of the country called for by Lenin. The Soviet people were solving the main task successfully—to catch up and overtake the main capitalist countries in *per capita* production. More funds must be invested in the building of heavy industry. The building of some hydro-electric power stations must be stopped for a time to give priority to the building of thermal stations.

The Kuibyshev station contains 20 turbo-generators with a total capacity of 2,100 MW. It will be operated by remote control from Moscow, 560 miles away, and according to Soviet reports only four men will be on duty in the machine hall.



The stand of the South Eastern Electricity Board at the recent Tunbridge Wells and South Eastern Counties Agricultural Show

Nuclear Project

It has been reported from Maastricht, in Holland, that plans are being prepared for the joint construction of an atomic energy station by the Limburg Electricity Company and two Belgian electricity concerns. This station is expected to be built at the Belgian town of Mol, near the Dutch border, where a small testing plant and an experimental nuclear reactor have been established already.

Victoria Seeks N.S.W. Aid

Victoria is threatened with black-outs this winter and has appealed to the N.S.W. Electricity Commission to assist with supplies of bulk power. On one day recently the Commission met a record demand of 1,462 MW in New South Wales and supplied Victoria with 5,000 kW.

FORTHCOMING EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Thursday, 17th July, to Thursday, 27th September

CARDIFF.—Cardiff Castle. *Daily Telegraph* "Son et Lumière."

Thursday, 31st July, to Saturday, 11th October

GREENWICH.—"Son et Lumière." Presented for the Ministry of Works by Atlas Lighting, Ltd.

Tuesday, 26th August

BIRKENHEAD.—Prenton Golf Course. Electrical Industries Golf Championship, Merseyside and North Wales Area Competition.

Wednesday, 27th August, to Wednesday, 3rd September

GLASGOW.—British Association for the Advancement of Science. Annual meeting.

Wednesday, 27th August, to Saturday, 6th September

LONDON.—Earls Court. National Radio and Television Exhibition.

Tuesday, 2nd September, to Thursday, 11th September

LONDON.—Olympia. Domestic Equipment Trades Fair.

Tuesday, 16th September, to Friday, 19th September

HARROGATE.—Association of Public Lighting Engineers. Annual conference.

Monday, 22nd September, to Saturday, 27th September

MANCHESTER.—City Hall. National Business Efficiency Exhibition.

Tuesday, 23rd September

LONDON.—Caxton Hall. A.S.E.E. Electrical Engineers Exhibition. Ballot meeting.

Wednesday, 24th September, to Friday, 3rd October

LONDON.—Olympia. Industrial Fuel Efficiency Exhibition.

Thursday, 25th September

LONDON.—Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker Mr. W. Laver.

Friday, 26th September, to Saturday, 4th October

LONDON.—Earls Court. Commercial Motor Show.

Monday, 29th September

VIRGINIA WATER.—Wentworth Golf Course. Electrical Industries National Golf Championship finals.

NEW ELECTRICAL EQUIPMENT

Soldering Tool

A multi-purpose soldering tool called the "Victor V.360" is announced by the ALLIED DISTRIBUTING CO., LTD., Rathbone Street, London, W.1. The "Victor" is based on the principle of heating the work direct instead of by the conventional soldering iron method of transferring a small amount of heat from a pre-heated mass of metal.

The work is heated by gripping it with the twin arms of the tool. At the end of the arms, which act as leads for the electricity supply, are special carbon electrodes which convey the heat directly to the work. The joint to be soldered is held by the twin

"Victor" soldering tool

arms, the button is pressed, the work immediately heats up and the solder runs. The button is then released, breaking the heating circuit, and the joint is held for a few seconds for the solder to harden.

No pre-cleaning of the work, even of oil, is necessary except in cases where the metal has been previously oxidised. The earth return lead permits the use of one arm only, if required.

The "Victor" can operate on any voltage from 2 V to 8 V, depending on the size of the job, although 6 V is normal. When soldering very fine work (30 s.w.g. and over) a 2 V supply would be sufficient for fast, efficient operation. It will solder solid copper, brass or other solderable material from $\frac{1}{64}$in to $\frac{3}{16}$in diameter or equivalent surfaces. The retail price of the V.360 is £2 2s in standard form.

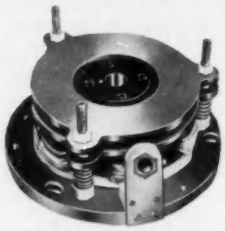
For heavier work, the "Venum" soldering tool is recommended and is based on exactly the same principle as the "Victor" but its nominal rating is 30 A at 6 V and it will operate from 6 to 12 V, depending upon the type of work. It will solder solid copper, brass, etc., from $\frac{1}{64}$in to $\frac{1}{4}$in diameter or equivalent surfaces. The retail price is £4 4s in standard form.

Electromagnetic Brake

A three-phase electromagnetic disc pattern brake suitable for use with British Standard induction motors ranging from 3 to 10 h.p. rating has been introduced by MTE CONTROL GEAR, LTD., Leigh-on-Sea, Essex. It is particularly suitable for automatic sequences, unit head drives or for any application requiring quick stopping. It is a "fail-to-safety" brake, being electrically released and mechanically applied by powerful specially calibrated springs. The designed negative torque of 30 lb/ft is exceptionally consistent in both forward and reverse directions.

Disc type brake linings are used and a full working life on the linings can be obtained without adjustment as wear compensation is entirely automatic. Six coils (two per phase) are embedded in a specially constructed laminated core which can operate satisfactorily over very wide air gaps. The holding VA is 150. A plate carrying brake linings on both sides is employed which, due to its floating type construction, enables the user to allow reasonably free tolerances when fitting to driving or driven machinery.

Calibrated springs of particularly robust design control the torque requirement; these are held off whilst the motor is running but apply braking effort immediately the brake is de-energised. The brake mechanism is enclosed in a substantially constructed cast alloy casing attached to the brake back plate which may either be spigoted on to any suitable housing or mounted by studs off the motor end shield. The assembly has a diameter of 8in and Type DM30-A is suitable for mounting to an assembly



MTE electromagnetic brake

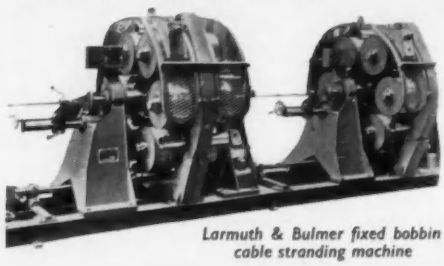
using a stub shaft, and Type DM30-B for mounting where a through shaft is required. Leads are brought out through a small conduit reception hole in the casing.

Cable Stranding Machine

A fixed bobbin stranding machine has been added to the range of cable-making machines of LARMUTH & BULMER, LTD., Todleben Works, Unwin Street, Salford, 6, Lancashire. The machine will produce the same high quality stranding by the "sun and planet" method with a 50 per cent higher rate of production on copper stranding and even greater when stranding aluminium. Initial capital costs are considerably reduced and the compact construction saves floor space. Automatic control, ease of loading and lower maintenance costs are features of the new machine.

The machine is suitable for cabling hard or annealed copper strands from 0·045in minimum up to 0·140in maximum or hard alloy aluminium from 0·045 to 0·155in. It consists essentially of either 6 or 12 bobbin heads carrying bobbins 16 or 22in in diameter which can be arranged in any layer combination of 6 or 12 wires to produce multi-concentric cables.

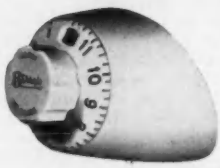
Each section of the machine is arranged for independent rotation in both directions and to increase the flexibility of the machine it can be assembled in tandem formation. The operator's control panel for stopping, starting and inching the machine during loading is conveniently placed on the front of each head above the lay plate.



Larmuth & Bulmer fixed bobbin cable stranding machine

Time Switch

The "Warm-Welcome" time switch, which can be set to operate at any time within twelve hours, is the latest development of BERRY'S ELECTRIC, LTD., Touchbutton House, Newman Street, London, W.1. The many uses



Berry's Electric "Warm-Welcome" time switch

of this switch provide for the automatic switching on of electric fires or radiators, immersion heaters, etc., and room lighting.

The unit itself fits neatly on the skirting board or, with extra fixing brackets, can be moved with a portable appliance to any part of the house without breaking the electrical connections. It is provided with a suitable length of flexible to which a plug is connected in the usual way.

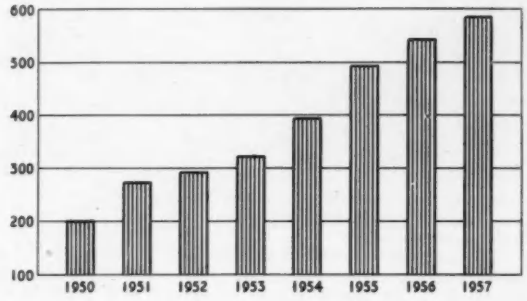
The "Warm-Welcome" is available in either ivory or mahogany finish and is priced at £2 19s 6d.

Cable Glands

A range of "Nylon" weatherproof cable glands, in $\frac{1}{2}$in conduit entry sizes, is now being marketed by METWAY ELECTRICAL INDUSTRIES, LTD., Metway Works, Brighton, 7. The list prices, per dozen, are £1 (black) and £1 1s 6d (white).

WEST GERMANY'S ELECTRICAL PRODUCTION AND TRADE IN 1957

Continued Development as a Competitor and Market



Index of production of the West German electrical industry per working day (1936=100)

THE total output of West Germany's electrical manufacturing industry increased more slowly last year than in 1956 (11 per cent compared with 16 per cent), but the proportion of goods exported rose by 1 per cent to 22·8 per cent. As can be seen from Table 1 the actual value of production in 1957 was £1,122 million, and exports amounted to £256 million. Electrical goods worth £24·2 million were imported during the year; these represented 2·45 per cent of production and 9·5 per cent of exports, the latter percentage having remained the same for the past two years.

There was a further increase during the year both in the number of manufacturers and in the number of employees. The adoption of improved techniques and equipment has substantially enlarged the industry's productive capacity, despite the slowing down in the growth of the labour force and the shortening of working hours. The chart shows that the index of production has increased from 200 in 1950 to 585 last year. The highest output by value in 1957 was radio and television equipment (£103·8 million), followed by motors and generators (£78 million), switchgear and switchboards (£57·9 million), insulated wire and flex (£48·1 million), electrical equipment for tractors and cars (£45·1 million) and cables (£42·5 million).

The importance of Europe as a market for German exports (over 50 per cent of the total in 1957) is evident from Tables 3 and 5, and with Table 4 they show that Germany is both a formidable competitor and a valuable market. Among her principal imports are domestic appliances, radio and television components and nuclear equipment. Holland continues to be Germany's best customer for electrical goods, and the United States is her main supplier. Exports to the United Kingdom in 1957 were valued at £5 million and imports from the U.K. at £2·7 million.

The decline in world demand was beginning to be felt in the West German economy by the end of last year, but nevertheless there was a continued tendency for prices to rise slightly. A particular cause was the increase in the price of coal and steel, which took place in October and November. Although order books were, by and large, full, the number of new orders received had levelled off and there was some apprehension for the future due to the increases in labour costs and the effects of the lower prices of raw materials on the purchasing power of the producing countries. On the whole it is not expected that trade will continue at the same rate as last year.

Table 1.—Basic Statistics of West Germany's Electrical Industry

	1956	1957
Number of electrical manufacturers	1,873	1,950
Number of employees	546,577	578,100
Out of which wage earners	415,691	439,952
Wages (£ million)	142	154
Salaries (£ million)	78	88
Total production (£ million)	999	1,122
Total exports (£ million)	214	256
Total imports (£ million)	19·5	24·2
Ratio exports/production (%)	21·8	22·8
Ratio imports/production (%)	1·96	2·45
Coal consumption (000 t)	498	456
Fuel oil consumption (000 t)	44·2	53·4
Gas consumption (mill m³)	108	102
Electricity consumption (mill kWh)	1,212	1,302

Table 2.—Production of West Germany's Electrical Industry

Class	Value (£ million)	
	1956	1957
Motors and generators (excl. welding generators)	73·0	78·0
Transformers	36·0	33·0
Rectifiers	5·9	6·0
Accumulators and batteries	15·0	16·0
Capacitors	2·9	3·2
Switchgear and switchboards above 1 kV	14·5	13·1
Switchgear and switchboards up to 1 kV	41·5	44·8
Installation material up to 1 kV	25·9	27·6
Insulated wire and flex	49·6	48·1
Cables	46·0	42·5
Cables and power line accessories	7·8	8·1
Power tools, up to 2 kW	6·9	6·3
Welding equipment	6·5	7·2
Industrial furnaces	7·1	7·7
Heating appliances	36·0	41·0
Motor driven domestic appliances	56·0	68·0
Refrigerators and deep freezers up to 250 litres	28·0	39·0
Filament lamps	9·8	9·6
Fluorescent lamps	3·7	4·6
Wire communication equipment	38·5	39·0
Radio communication equipment	5·8	6·1
Signal and safety appliances	6·1	7·1
Radio and T.V. equipment	88·5	103·8
Electro-acoustical equipment	26·2	36·8
Electronic tubes and transistors	12·7	17·5
Components for communicating equipment	22·5	25·2
Measuring instruments	17·2	18·1
Household meters	6·6	6·3
Control and regulating apparatus	9·3	11·9
Electro-medical apparatus	12·2	12·6
Industrial traction equipment	1·2	1·4
Electrical equipment (tractors and cars)	42·8	45·1

Table 3.—Principal Destinations of West Germany's Electrical Exports

Country	Value (£ 000)	
	1956	1957
Argentina	6,052	5,620
Australia	1,544	2,077
Austria	9,811	12,709
Belgian Congo	943	1,003
Belgium/Luxembourg	14,210	17,057
Brazil	1,732	3,462
Canada	901	1,947
Chile	1,756	2,164
Colombia	3,251	1,532
Denmark	3,521	4,409
Egypt	2,511	2,322
Eire	103	608
Finland	4,151	4,114
France	5,993	6,572
Greece	2,815	3,522
Holland	26,214	26,534
India	5,452	8,381
Indonesia	2,536	3,326
Iran	3,111	4,008
Iraq	9,422	1,283
Italy	14,321	16,632
Israel	2,966	1,932
Lebanon	955	1,009
Malaya and Singapore	961	921
Morocco	102	672
Mexico	1,121	2,971
Norway	5,913	7,051
Pakistan	2,531	973
Peru	1,634	1,574
Poland	951	2,023
Portugal	2,822	3,523
Saar	5,214	6,053
Saudi Arabia	959	1,433
South Africa	2,221	3,823
Spain	2,440	2,680
Sweden	16,851	21,074
Switzerland	11,843	10,714
Turkey	2,561	2,198
United Kingdom	2,932	4,991
United States	7,903	12,732
Venezuela	4,283	4,453
Yugoslavia	2,933	3,621

Table 4.—Principal Sources of West Germany's Electrical Imports

Country	Value (£ 000)	
	1956	1957
Austria	882	1,083
Belgium/Luxembourg	621	663
Denmark	813	783
France	651	1,087
Holland	4,753	4,837
Italy	371	522
Saar	651	671
Sweden	545	675
Switzerland	3,462	4,153
United Kingdom	2,231	2,731
United States	5,605	5,522

Table 5.—West Germany's Electrical Exports in 1957 (1956 totals in parentheses). Values in £000

Motors and generators up to 10 kW	6,327	(5,602)
United Kingdom	183	
Belgium	451	
Denmark	300	
France	270	
Italy	398	
Holland	814	
Norway	336	
Austria	216	
Sweden	743	
Switzerland	686	
Ditto, 10–1,000 kW	6,213	(5,092)
Belgium	432	
Finland	255	
Italy	381	
Holland	641	
Norway	289	
Sweden	498	
Argentina	204	
India	508	
Iran	210	
Motors and generators above 1,000 kW	2,910	(1,880)
Norway	200	
Austria	394	
Mexico	555	
Venezuela	214	
India	419	
Rotary convertors	733	(680)
Holland	114	
Complete generator sets	11,857	(6,352)
Finland	509	
Holland	691	
Poland	671	
South Africa	325	
Canada	463	
Mexico	485	
Argentina	782	
Brazil	940	
India	481	
Indonesia	672	
Transformers and chokes, excluding welding transformers	6,043	(5,223)
Saar	506	
Finland	134	
Holland	759	
Austria	304	
Sweden	502	
Turkey	195	
South Africa	138	
Argentina	616	
Venezuela	139	
India	478	
Rectifiers	2,397	(1,832)
France	217	
Italy	218	
Holland	260	
Austria	174	
Switzerland	186	
Parts of motors, generators, rotary convertors, transformers, etc.	4,039	(3,631)
Belgium	224	
Denmark	262	
France	361	
Italy	268	
Holland	511	
Sweden	260	
Switzerland	515	
India	272	
Accumulators	2,387	(2,361)
Iran	232	
Vietnam	105	
Electric power tools	3,518	(3,282)
Belgium	241	
Italy	354	
Holland	346	
Austria	356	
Sweden	198	
Switzerland	352	
Vacuum cleaners and floor polishers	2,723	(2,252)
United Kingdom	262	
Belgium	247	
Italy	271	
Holland	353	
Norway	187	
Austria	433	
Switzerland	142	
South Africa	168	
Electric hairclippers and dry shavers	1,451	1,282)
Holland	164	
Switzerland	228	
United States	263	
Ignition apparatus for vehicles	2,633	(2,322)
Belgium	141	
Holland	163	
Austria	405	
Sweden	445	
Australia	192	
Electric traction equipment	7,230	(7,152)
Belgium	425	
Denmark	265	
France	181	
Italy	279	
Electric traction equipment—*continued*		
Holland	532	
Norway	238	
Austria	550	
Sweden	1,537	
Switzerland	261	
Electric welding equipment	2,775	(2,121)
Saar	108	
Belgium	115	
France	211	
Italy	197	
Holland	290	
Austria	117	
Switzerland	250	
Taiwan	137	
Industrial furnaces	3,774	(2,272)
United Kingdom	287	
France	354	
Greece	232	
Italy	246	
Switzerland	210	
India	245	
Japan	200	
Industrial and domestic cookers	2,639	(2,103)
Belgium	289	
Greece	217	
Holland	243	
Austria	277	
Sweden	213	
Switzerland	318	
Flat irons	1,139	(1,012)
Belgium	103	
Holland	145	
Austria	150	
Heating appliances, other, including elements	4,006	(3,522)
United Kingdom	241	
Belgium	349	
Italy	251	
Holland	377	
Austria	338	
Sweden	301	
Switzerland	359	
X-ray apparatus, tubes and components	4,503	(5,013)
United Kingdom	125	
Denmark	144	
Finland	172	
Italy	312	
Holland	284	
Austria	166	
Sweden	283	
Switzerland	217	
United States	203	
Mexico	353	
Brazil	338	
India	129	
Electro-medical apparatus	1,934	(1,673)
Italy	164	
Austria	151	
Switzerland	171	
Telephone apparatus	9,667	(9,442)
Saar	355	
Belgium	413	
Finland	304	
Greece	281	
Italy	976	
Luxembourg	168	
Holland	436	
Norway	221	
Mexico	227	
Argentina	1,507	
Venezuela	290	
Indonesia	300	
Iran	1,106	
Pakistan	429	
Telegraph apparatus	3,641	(2,822)
Holland	325	
Sweden	344	
Switzerland	297	
Canada	278	
Microphones, amplifiers and loud-speakers	1,226	(1,062)
United Kingdom	125	
Switzerland	113	
Radio transmitting and receiving equipment	41,490	(32,553)
United Kingdom	926	
Belgium	2,801	
France	732	
Greece	687	
Italy	2,841	
Holland	5,700	
Austria	769	
Portugal	1,108	
Sweden	5,197	
Switzerland	2,972	
South Africa	581	
United States	5,220	
Venezuela	586	
Iran	502	
Electric signalling and safety apparatus	1,237	(1,342)
Portugal	109	
Sweden	160	
Capacitors	2,195	(1,852)
Italy	259	
Holland	355	
Sweden	239	
Switchgear	12,790	(10,515)
Saar	689	
Belgium	799	
Finland	444	
Italy	932	
Yugoslavia	487	
Holland	1,008	
Norway	458	
Austria	652	
Poland	343	
Sweden	706	
Switzerland	387	
Turkey	432	
Egypt	939	
Argentina	599	
Brazil	318	
India	650	
Israel	361	
Installation material up to 750 V	7,045	(6,200)
Belgium	442	
Italy	291	
Holland	1,620	
Norway	492	
Austria	259	
Sweden	1,162	
Switzerland	368	
India	966	
Control and regulating apparatus	5,008	(3,951)
Belgium	303	
Italy	535	
Holland	526	
Sweden	472	
Switzerland	494	
Insulated wires and flex	8,260	(8,502)
Belgium	498	
Greece	310	
Holland	787	
Sweden	789	
Switzerland	330	
Venezuela	523	
India	481	
Indonesia	314	
Cables	12,834	(15,310)
Saar	521	
Holland	962	
Sweden	927	
Turkey	420	
South Africa	415	
United States	2,026	
Argentina	643	
India	1,046	
Pakistan	585	
Indonesia	503	
Electrodes and carbons	3,407	(2,499)
Italy	596	
Norway	441	
Sweden	396	
Switzerland	587	
Insulators	854	(951)
Italy	114	
Holland	101	
Switzerland	138	
Filament lamps	1,843	(1,531)
Holland	151	
Norway	136	
Sweden	217	
Switzerland	106	
Fluorescent lamps	215	(162)
Electronic tubes, c.r. tubes and parts	4,352	(2,751)
United Kingdom	422	
Belgium	682	
Denmark	325	
Italy	783	
Holland	504	
Sweden	314	
United States	255	
Complete power stations	4,933	(2,861)
Italy	921	
Spain	816	
Egypt	8,494	
Nicaragua	638	
India	931	
Indonesia	340	
Iraq	225	
Locomotives, electric	558	(266)
Yugoslavia	81	
Switzerland	98	
Costa Rica	215	
Water wheels and turbines	3,282	(1,780)
Austria	1,205	
Spain	334	
Venezuela	472	
India	235	
Steam engines and turbines without boilers	2,124	(1,472)
Belgium	116	
Holland	272	
Poland	180	
Switzerland	205	

Financial Section

STOCKS and SHARES

STOCK EXCHANGE markets have been rather more active than might be expected when the height of the holiday season coincides with a period of anxiety in international politics. In the gilt-edged market, prices tended to move further forwards in anticipation of another Bank Rate reduction, and in the process helped the leading industrial shares to maintain a firm front. In the latter market there is quite a lot of news, at this season, from the companies which make up their accounts to the end of March. In these reports the persistent theme deals with narrowing margins of profit, which appear often to be causing more concern than the volume of turnover and new orders. Dividends are being generally well maintained, and few of them seem to be in any serious jeopardy in the light of the trading outlook.

Better Prices

By the beginning of this week many industrial shares had advanced to their best prices of the year. Of the leaders in the electrical market, A.E.I. moved up to 51s 3d, and G.E.C. went further ahead to 35s-x.d. under the influence of the annual report. New "highs" for 1958 were recorded by Brook Motors at 38s 9d, Aberdare Holdings at 12s 6d, E.M.I. at 39s 6d, Elliott-Automation at 15s, and Dictograph at 6s 6d. Many shares connected with domestic equipment were in favour, notably Vactric at 19s 6d, also British Vacuum Cleaner at 5s 9d, Bulpitts at 7s 9d, and Morphy-Richards at 16s 9d, although Hoover have been a little reactionary since the company's half-yearly report. Cossor at 5s 9d were much in demand in advance of the annual results. British Aluminium continued their strong recovery to over 50s. Johnson & Phillips and other cable shares have been firm.

Pye Results

The 5s deferred shares of Pye, Ltd., have been strongly supported since the announcement of the results for the year ended last March. At 13s 9d, the "A" shares show a yield of a fraction over 4½ per cent on the 12½ per cent rate of dividend paid now for four years in succession. At the time of the company's issue of £2½ million debenture stock in April, shareholders had been warned to expect a reduction of up to one-sixth in the 1957–58 earnings. In the event, the group trading profit of £1,661,000 reported in the preliminary statement is within about £20,000 of the previous year's figure, although there is a 14 per cent reduction, to £590,000 (after tax), in the net surplus attributable to members of the company. On these figures, the dividend is now covered about 2½ times by available earnings. The new 6 per cent debenture stock, issued to stockholders at a price of 98, is now fully paid-up and quoted at about 100.

Thorn Electrical Earnings

A further expansion of 10 per cent in the trading profits of Thorn Electrical Industries during the twelve

Price Changes in

Company or Board	Nom. Value	Middle price 11th Aug.	Two Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	76		3	3	3 19 0	76	72
Brit. Elec. 1974/77	100	72x.d.		3	3	4 3 3	73½	68½
Brit. Elec. 1976/79	100	77		3½	3½	4 11 0	77½	72
Brit. Elec. 1974/79	100	87		4½	4½	4 17 9	87	82½
Overseas Electric Supply								
Calcutta Elec.	£1	16/-		6†	6·8†	8 10 0†	16/9	15/-
East African Power	£1	19/-	+6d	7½	8	8 8 6	19/-	17/6
Nigerian Elec.	£1	12/6	−1/3	10	10	16 0 0	17/-	12/6
Perak Hydro-Elec.	£1	13/6		10	12½	18 10 6	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	12/6	+6d	17½	17½	7 0 0	12/6	9/9
Aerialite	1/-	7/-	+3d	48	51½	7 7 3	7/-	5/1
Allen, W. H.	£1	37/3		10	11	5 18 0	37/3	32/9
Anglo-Portuguese Tel.	£1	25/9	+1/-	8	9	6 19 9	27/3	19/9
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	57/6	53/-
Assoc. Elec. Ord.	£1	51/3	+1/3	15	15	5 17 0	51/3	46/6
Automatic Tel. & El.	£1	66/3		17	17	5 2 6	66/3	57/-
Babcock & Wilcox	£1	47/-		15	13‡	5 10 9	52/9	41/9
Bakelite	10/-	18/9		15	15	8 0 0	21/-	17/6
Baldwin, H. J.	2/-	2/6		20	20	16 0 0	3/9	2/6
Berry's Electric	5/-	6/9	+9d	10	10	7 8 3	7/6	5/9
British Aluminium	£1	50/9	+3/3	12	12	4 14 6	50/9	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	27/-	+1/-	25	25	4 12 6	27/-	19/6
B.I. Callender's	£1	43/-	+9d	12½	12½	5 16 3	45/6	38/9
B.I. Callender's 6% Pref.	£1	19/-		6	6	6 6 3	20/3	19/-
British Tabulating	£1	50/6		9	10	3 19 3	51/3	38/6
British Thermostat	5/-	30/-	+6d	25	30	5 0 0	30/-	19/9
British Vac. Cleaner	5/-	5/9	+6d	10	10	8 14 0	5/9	4/6
Brook Motors	10/-	38/9	+1/3	25	25	6 9 0	38/9	33/3
Bulgin, A. F.	1/-	5/3		40	45	8 11 6	5/6	4/7
Bulpitts	5/-	7/9	+3d	—	12½‡	8 1 3	7/9	7/3
Burco Dean	5/-	8/6	+3d	20	22½	8 16 6*	9/6	7/9
Cable & Wireless: Ord.	5/-	10/-x.d.	−3d	10	10‡*	5 0 0	10/6	8/-
4% Loan	100	93½		4	4	4 5 6	94½	89
Chloride El. Storage "A"	£1	58/9	+1/9	17½	17½	5 19 3	62/-	55/6
Clarke Chapman	£1	58/9x.c.		27½	27½	4 13 6*	72/6	55/-
Cole, E. K.	5/-	15/3		17½	17½	5 14 9	18/-	15/3
Cossor, A. C.	5/-	5/9	+1/3	Nil	2½	2 3 6	5/9	4/4
Crabtree	10/-	28/6		20	20	7 0 3	28/6	24/4
Crompton Parkinson Ord.	5/-	10/6	+3d	16	16	5 1 6*	10/6	8/3
De La Rue	10/-	23/6	+9d	35	17½*	7 9 0	26/3	20/9
Decca "A"	4/-	25/3x.d.		43‡	43‡	6 18 6	27/6	21/3
Desoutter	5/-	16/6		32½	18‡*	5 13 9	16/6	13/6
Dewhurst	2/-	7/9	+3d	16½	20	5 3 3	8/-	6/9
Dictograph Tel.	2/-	6/6	+3d	20	20*	6 3 0	6/6	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	8/3	+3d	25	25	7 11 6*	9/4	7/9
E.M.I.	10/-	39/6	+2/3	15	15	3 16 0	39/6	27/6
Electrical Components	5/-	8/-x.d.	+9d	12½	12½	7 16 3	8/-	7/-
Elec. Construction	£1	23/9		8½	8½	7 3 3	25/-	21/-
Elliott-Automation	5/-	15/-	+6d	—	10‡	3 6 9	15/-	11/6
Enfield Cable Ord.	£1	14/-	+6d	Nil	2½	3 11 6	17/-	10/9
English Electric	£1	55/9	+9d	14	14	5 0 3	56/3	44/-
English Electric 3¾% Pref.	£1	12/-		3¾	3¾	6 5 0	12/3	11/9
Ericsson Tel.	5/-	21/-	+6d	22†	12*†	2 17 3†	21/-	17/6
Ever Ready	5/-	18/6		37½	20*	5 8 0	19/3	13/9
Falk Stadelmann	£1	36/3		17½	17½	9 13 0	38/9	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

months to March of this year came up to most market expectations. A year ago the company reported a 20 per cent expansion of earnings and raised the dividend from 15 to 17½ per cent. That rate is being repeated for the latest year, and from the preliminary statement it appears to leave three-quarters of the surplus to be ploughed back. It was in this period that the arrangements were concluded with Electric and Musical Industries under which the control of "His Master's Voice" and Marconiphone radio and television passed to Thorn Electrical. A 4½ per cent yield on the 5s "A" shares, at 20s 6d, reflects the conservative character of the dividend.

Electrical Investments

Company or Board	Nom. Value	Middle price 11th Aug.	Two Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	35/-x.d.	+2/-	12½	10	5 14 3	38/9	29/3
G.E.C. 6½% Pref.	£1	20/3		6½	6½	6 8 6	21/3	20/3
General Cables	5/-	9/9	−3d	30	24	—	11/9	9/9
Greenwood & Batley	£1	48/3		17½	20	8 5 9	48/3	45/-
Hackbridge Holdings	5/-	13/3		20	20	7 11 0	14/3	7/6
Hackbridge & Hewittic	5/-	11/6	+6d	20	20	8 14 0	12/-	9/7
Head Wrightson	5/-	20/3		22½	17½*	4 6 6	22/3	16/9
Heatrae	2/-	6/3	+3d	15	20	6 8 0	6/3	4/-
Henley's	10/-	11/6	+3d	11½	11½	10 0 0	14/6	10/6
Holophane	5/-	13/3		30	37½	8 10 0*	13/9	12/6
Hoover	5/-	42/6x.d.	−1/-	50	50	5 17 9	44/-	31/-
I.C.I.	£1	31/6	+2/3	10	12	5 1 6*	31/6	23/9
Intl. Combustion	5/-	26/-	−6d	22½	25	4 16 3	26/6	19/3
Johnson & Phillips	£1	17/6	+1/3	10	5	5 14 3	25/-	15/-
Lancashire Dynamo	£1	40/-		11	11	5 10 0	40/-	28/6
Laurence Scott	5/-	14/9		15	15	5 1 9	14/9	12/6
Lister, R. A.	£1	24/6		10	10	8 3 3	26/3	23/-
London Elec. Wire	£1	46/3	+1/3	12½	12½	5 8 0	46/3	39/6
Lucas, J.	£1	37/6	+9d	7½	7½	4 0 0	37/6	27/9
Marconi Marine	£1	34/-	+2/-	10	10	5 17 9	34/-	29/-
Marryat & Scott	2/-	13/3		35	37½	5 13 3	14/-	10/3
Mather & Platt	£1	38/9		15	15	5 3 3*	40/-	29/6
Metal Industries	£1	34/6	−6d	9	14	8 2 3	35/-	22/9
Midland Elec. Mfg.	£1	47/6	+1/3	12½	12½	5 5 3	48/3	44/-
Morphy-Richards	4/-	16/9	+9d	50	20*	4 15 6	16/9	14/6
Murex	£1	48/-x.d.	−1/3	20	17½	7 5 9	58/3	48/-
Newman Ind.	2/-	2/3		10	10	8 17 9	2/9	2/3
Oldham & Son	1/-	2/6		17½	17½	7 0 0	2/7	2/3
Parnall (Yate)	5/-	15/-		12	12	4 0 0	15/-	5/9
Parsons, C. A.	£1	46/3		8½	7½*	3 4 9	53/6	43/-
Plessey	10/-	59/-	+1/-	30	30	5 1 9	60/6	55/-
Pye "A" Deferred	5/-	13/9x.d.	+1/6	12½	12½	4 11 0	13/9	10/-
Reyrolle	£1	77/6	+1/3	17½	17½	4 10 3	84/6	73/6
Rheostatic	4/-	6/-		12½	12½	8 6 9	8/-	6/-
Richardsons Westgarth	10/-	13/9	+3d	16½	8½*	6 1 3	15/-	13/-
Scottish Cables	4/-	16/9	+6d	27½	27½	6 11 3	16/9	12/3
Simon-Carves	5/-	27/-	+3d	20	25	4 12 6	27/9	22/6
Smith (England), S.	4/-	9/9	−3d	17½	20	4 2 0*	10/-	7/-
Southern Areas	£1	9/9		7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	5/3	+6d	15	15	14 5 9	6/3	4/9
Sturtevant	5/-	14/9		15†	15†	5 1 9†	18/-	14/9
Sun Elec.	£1	50/-		25	25	10 0 0	50/-	47/3
Switchgear & Cowans	5/-	11/9		25	22½	9 11 6	11/9	8/9
Taylor Tunnicliff	5/-	13/3		15	17½	6 12 0	13/9	11/9
T.C.C.	10/-	32/6	−1/3	25	25	7 13 9	38/6	32/6
T.C. & M.	£1	23/6		8½	8½‡	7 4 9	27/-	20/-
Telephone Mfg.	5/-	4/9		10	10	10 10 6	5/3	4/6
Telephone Rentals	5/-	12/-		12½	12½	5 4 3	12/-	9/9
Thompson (John)	5/-	24/-		25	25	5 4 3	27/-	23/-
Thorn Elec. "A"	5/-	20/6	−9d	17½	17½	4 5 3	23/3	17/-
Thornycroft	£1	22/6	+1/3	12½	12½	11 2 3	27/9	21/-
Tube Investments	£1	55/-		13½	15	5 9 0	55/6	48/3
Vactric	5/-	19/6	+4/-	25	25	6 8 3	19/6	14/3
Veritys	5/-	5/3		12½	2½	2 7 6	6/9	5/3
Walsall Conduits	4/-	15/3		20	22½	5 18 0	15/3	11/-
Ward & Goldstone	5/-	27/-		40	25*	4 12 6	29/-	23/6
Watford	2/-	6/3	−3d	25	25	6 8 0*	7/6	5/-
Westinghouse	£1	38/-	−6d	18	10*	5 5 3	40/-	32/3
West, Allen	5/-	11/9		15	12½*	5 6 6	12/-	9/3
Wolf Electric	5/-	7/3		20	10*	6 18 0	9/-	6/9

Avo Dividend

Financial results of Avo, Ltd., covering twelve months to last March, are the first to be announced since the introduction of the company's 2s shares to the Stock Exchange about a year ago. At that time the directors envisaged dividends totalling not less then 20 per cent. An improvement on that rate was indicated later by the declaration of a 12½ per cent interim, and a final payment of like amount now brings the distribution for the year to 25 per cent. Although the tax charge is substantially higher, at £112,000, the net surplus comes out above the previous year's at £82,500, and this covers more than twice over the amount distributed in the dividend. There is a return of 7 per cent on the 2s shares at 7s 1½d. The capital of the company is £250,000.

Hackbridge & Hewittic

An expansion of about 11 per cent in the trading profits of Hackbridge & Hewittic in the 1957–58 period, to £481,000, was attributed by the chairman at the annual meeting to the factory improvements carried out in previous years. Higher output and efficiency offset the effects of the generally prevalent tendency towards narrower margins of profit. With the latter trend persisting, he said that only by maintaining or raising the present high rate of production could similar results be expected in future. As regards orders, he was able to report that prospects were satisfactory so far as the heavier products were concerned, and that if demand for the smaller capacity items were kept up all sections of the business would be well placed. Referring to the financial position, he called shareholders' attention to the replacement of last year's £101,000 overdraft by cash holdings of £130,000 in the latest balance sheet. The price of the 5s shares has improved lately to 11s 6d, which provides a yield of 8¾ per cent from the 20 per cent dividend.

Hackbridge Holdings

There was little alteration in the price of Hackbridge Holdings 5s shares, at 13s 3d, after the announcement of a final dividend of 12½ per cent for 1957–58. This is 2½ per cent more than last year's corresponding payment, and makes good an earlier reduction of the same amount in the interim dividend, leaving the total for the year unchanged at 20 per cent. Group profits were rather better than maintained during the year, and with a smaller tax provision the net surplus comes out some £12,000 larger at £135,000. There is consequently more than twofold cover for the dividend, on the basis of which the shares yield just over 7½ per cent.

REPORTS and DIVIDENDS

Hackbridge & Hewittic Electric Co., Ltd.—The annual meeting was held on 6th August, Mr. A. M. Browne (chairman and managing director) presiding. In his review of the year ended 31st March last, which had been previously circulated, the chairman said that facilities had been provided in the factory for the manufacture of a considerably greater proportion of transformers of the largest sizes. They also had an order book enabling them to take full advantage of the production facilities during the year; coincidently they had been able to increase the output of medium and smaller power transformers. The rectifier division was also well placed with orders, and rectifiers manufactured throughout the year had the benefit of many improvements in design. As a result a record output was obtained for mercury arc rectifiers. Thus the reduced profit margins generally prevalent were offset over the year by the benefits accruing from capital expenditure, development work and resulting improved designs, and consequent increased output and productivity.

During the year two more 275 kV 120 MVA transformers were completed for the Central Electricity Generating Board. They were also now completing for the Tasmania Hydro-Electric Commission three 100 MVA units for 220 kV service conditions and had also received from the C.E.G.B. orders for four more 275 kV units each of 180 MVA capacity. Each of these transformers was 50 per cent larger in capacity than the largest ones made so far. They had considerably advanced in the use of plate-type rectifiers and the supply and manufacture of germanium rectifier units. They had also progressed in the manufacture of high power quartz lamps and they had developed and established a range of overhead line switchgear which was already being supplied to the British Railways, Electricity Boards and to overseas clients.

Hick, Hargreaves & Co., Ltd.—Mr. W. D'Arcy Madden (chairman and managing director) presided at the annual meeting held on 7th August. In the course of his address, after referring to the acquisition of Foster, Yates & Thom, Ltd., said that Hick, Hargreaves showed some reduction in output during the year due to the completion of Ministry of Supply contracts referred to last year, and consequently there was now some capacity available at the Bolton works. The order book, however, still exceeded £5 million, and included a heavy programme of condensing and feed heating plant for the Central Electricity Generating Board for commissioning by the end of 1962, and to date one large plant for 1963. Owing to the greatly increased size of power units, fewer although larger contracts would be available in the future. The demand for their de-aerating and vacuum plants and for their rotary compressors and vacuum pumps continued at a satisfactory level.

Satisfactory orders had been received by Foster, Yates & Thom for rolling mill plant, hydraulic presses and rotocube mixers, and while there had been a decline in orders for boilers, signs of improvement were now apparent. Good progress had been made with the Foster-Wucher W.700 low pressure injection moulding machines.

In order to bring the issued share capital more into line with the capital employed, steps were now being taken for a bonus issue of one share for every two shares held, thus increasing the issued capital to £1,278,000 through the capitalisation of £426,000 from the capital reserve. Stockholders would also be asked to approve an increase in the authorised capital to £2,000,000.

Oldham & Son, Ltd.—The accounts for the year ended 31st March last were reviewed in our issue of 25th July.

In his statement, which has been circulated to shareholders, Mr. John Oldham (chairman and managing director) says that increasingly competitive conditions have prevailed during the year under review, but both at home and overseas there has been an increase in the volume and value of production and sales of the group. Wages, salaries and other expenses continued to rise, and at the year's end the value of lead stocks was reduced, consequent upon the fall in the price of that metal during the year. The burden of these increased charges has largely been absorbed by increased production. There is a reduction in the profit of the parent company for the year in spite of the fact that the turnover was substantially maintained. This is accounted for by increased expenditure during the year on technical development and sales promotion. Expansion of group sales is evidence that this programme is bearing fruit.

The new "Pg" double-sleeve power battery went into production during the year. This advanced design is well adapted to serve the market for battery-operated mechanical handling equipment and underground traction in the form of battery-operated mine locomotives. "Pg" batteries are already extensively used in the company's miners' lamps. In standard lines of production, the volume of business has exceeded that of the previous year. There has been a reduction in the production of special Government service type batteries due to reduced provisioning, but this has been offset by production in the other lines.

Direct exports again exceeded those of the previous period and over 30 per cent of their home production went into direct exports to over 80 countries. The overseas companies have continued to progress. Sales in South Africa, Australia and India have steadily increased, and the French company has further diversified its production by the addition of a number of new lines of manufacture.

Pye, Ltd., reports group profits for the year to 31st March last of £1,660,592, as compared with £1,680,660 for 1956-57. Taxation requires £929,000 and the balance attributable to the parent company, after minority interests, is £590,064 (against £685,072). The dividend for the year on the deferred and "A" deferred ordinary is maintained at 12½ per cent, and holders of the 8 per cent participating preferred ordinary again receive a total of 10 per cent.

Thorn Electrical Industries, Ltd.—The group trading profits for the year ended 31st March last amount to £2,343,238, as compared with £2,121,249 for the preceding year, and after meeting all charges, including £776,596 for taxation, the net profit, subject to audit, is £681,832 (against £635,054). It is proposed to pay an ordinary dividend for the year of 17½ per cent (unchanged).

Hackbridge Holdings, Ltd. — The group profit for the year to 31st March last is £313,073, as compared with £311,987 for 1956-57, and after providing £178,325 for taxation, the net profit is £134,748 (against £122,168). The dividend for the year is maintained at 20 per cent, by a final payment of 12½ per cent.

New Companies

Sobell Electrical Co., Ltd.—Registered 15th July. Capital £100. Manufacturers of and dealers in radio and television receivers and transmitters, electrical apparatus and appliances, etc. Regd. office: Langley Park, Slough, Bucks.

Industrial Suppliers Cambridge (1958), Ltd.—Registered 31st July. Capital £100 in £1 shares. Electrical and radio engineers and contractors, ironmongers, mill furnishers, etc. Directors: H. W. Gore, D. W. K. Barber and R. George. Regd. office: 15a and 17, Brecknock Road, N.7.

Liquidation

I. S. (Cambridge), Ltd. (formerly Industrial Suppliers (Cambridge), Ltd.).—Winding up voluntarily as a members' voluntary winding-up. Liquidator, Mr. L. A. Clemence, 46, Church Avenue, Beckenham, Kent, appointed 22nd July. Particulars of claims to the liquidator by 17th September.

This notice is formal. As far as can be ascertained the company is solvent and all claims should be met in full.

Bankruptcies

B. Landau, 60, Myrdle Street, Commercial Road, London, E.1, electrical engineer, lately carrying on business at 401, Commercial Road, E.1, and formerly carrying on business at 31, Cannon Street Road, E.1, both in the name of Landau Electrical Co., as a retailer of electrical goods and as an electrical contractor.—Trustee, Mr. R. A. Hawken, Bank Chambers, 1, John Street, London, W.C.1, appointed 25th July.

A. J. Sweeny, 86, Albert Road, South Norwood, London, S.E.25, electrical contractor.—First and final dividend of 9¼d in the £, payable on and after 22nd August at 58-61, York Terrace, Regent's Park, London, N.W.1.

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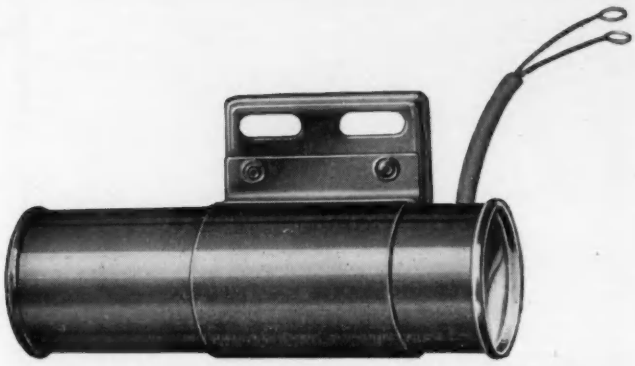

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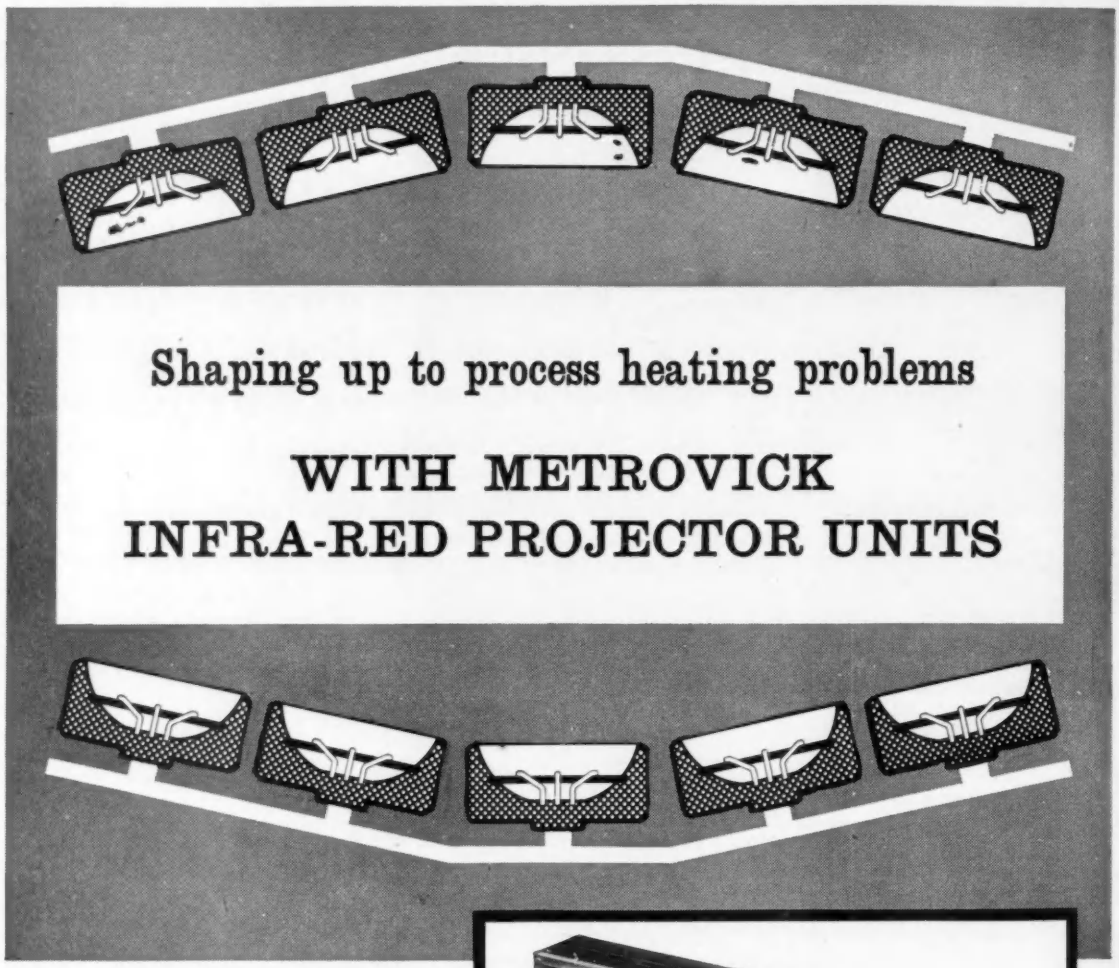

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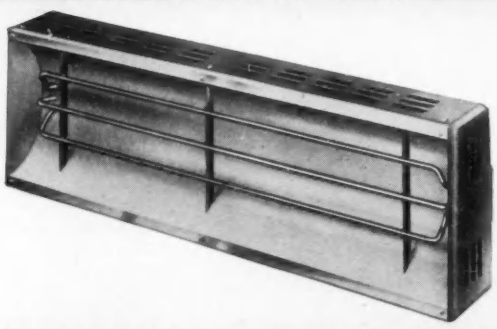

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

28707. United Kingdom Atomic Energy Authority.—Nuclear power plants. 14th January, 1955. (799575.)

32297. National Research Development Corporation.—Electronic digital computing machines. 15th November, 1954. (799705.)

33039. Metropolitan-Vickers Electrical Co., Ltd.—Electric lighting installations. 22nd November, 1954. (799543.)

1954

3860. United Kingdom Atomic Energy Authority.—Production of plutonium-aluminium alloys. 9th February, 1954. (799662.)

7253. Lancashire Dynamo Electronic Products, Ltd., and Whitlock, R. H.—Remote indicating and recording systems. 13th June, 1955. (799663.)

18269. N.S.F., Ltd. (Oak Mfg. Co.).—High frequency apparatus. 22nd September, 1955. (799682.)

26287. English Electric Co., Ltd.—Escapement devices. 9th September, 1955. (799665.)

27002. English Electric Co., Ltd.—Electrical instruments and relays. 16th September, 1955. (799632.)

29645. Landis & Gyr Akt.-Ges.—Superposition on a heavy current network of audio frequency signal voltages. 14th October, 1954. (799666.)

33918. Amp, Inc.—Electrical connectors of the pin and socket type. 23rd November, 1954. (799598.)

34901. Simplex Electric Co., Ltd.—Flameproof electrical lighting fittings. 2nd December, 1955. (799929.)

37310. Electric & Musical Industries, Ltd.—Method of forming translucent electrically conducting coatings on bodies of insulating material. 8th December, 1955. (799751.)

1955

249. General Electric Co.—Electromechanical transducer. 4th January, 1955. (799891.)

304. National Research Development Corporation.—Electronic attenuator of microwaves. 5th January, 1956. (799669.)

495. Magnetron peak current stabilisation. 8th February, 1956. (799822.)

1363. Igranic Electric Co., Ltd.—Electric motor controllers. 17th January, 1955. (799892.)

1963. Staatsbedrijf der Posterijen, Telegrafie en Telefonie.—Cyclic electronic counting circuit arrangement. 21st January, 1955. (799930.)

2379. British Thomson-Houston Co., Ltd.—Electric circuit arrangements. 18th January, 1956. (799980.)

3419. General Electric Co.—Electric current control devices utilising the semiconductor germanium. 4th February, 1955. (799670.)

3720. Amp, Inc.—Tools for making an electrical connection between an electrical terminal and a contact. 8th February, 1955. (799599.)

4056. Evershed & Vignoles, Ltd.—Indicating and controlling circuits. 19th January, 1956. (799864.)

5261 & 26434. Rank Cintel, Ltd.—Apparatus for determining the frequency of electrical signals. 22nd February & 14th September, 1956. (799825 & 799674.)

28219. Electric signal generators. 3rd October, 1956. (799530.)

5384. Clang, Ltd., and Barnett, A.—Electric plug and socket connectors. 23rd February, 1956. (799503.)

8777. Mullard Radio Valve Co., Ltd.—Transformer core clamping device. 6th June, 1956. (799505.)

9348. Baglow, D. V.—Adjustable supports for electric lamps and like articles. 28th June, 1956. (799893.)

11667. Clarostat Mfg. Co., Inc.—Process for forming a resistor track for a potentiometer. 22nd April, 1955. (799877.)

12201. Sylvania Electric Products, Inc.—Method of reactivating zinc-tin alloy electroplating anodes. 27th April, 1955. (799581.)

15800. Plessey Co., Ltd.—Triggering circuits for synchronised electric oscillators. 17th May, 1956. (799684.)

16320. Rank Cintel, Ltd.—Cathode-ray tube control circuits. 6th June, 1956. (799882.)

17276. Corning Glass Works.—Semiconductor components and their manufacture. 15th June, 1955. (799671.)

18232. Merlin Mouldings, Ltd.—Electric heating elements. 26th July, 1956. (799507.)

20584. British Thomson-Houston Co., Ltd.—Electric signalling systems. 6th July, 1956. (799883.)

23247. United Kingdom Atomic Energy Authority.—Electromagnetic pumps. 7th August, 1956. (799546.)

25059. Landis & Gyr Akt.-Ges.—Automatic electric circuit breaking switch adjustable to different rated currents. 31st August, 1955. (799510.)

25066. Jakobsbergs Elektrotekniska Fabriker Aktiebolag.—Magnetrons. 31st August, 1955. (799983.)

26884. British Thomson-Houston Co.—Electric discharge switching devices for radar equipment. 18th September, 1956. (799769.)

28331. Standard Telephones & Cables, Ltd.—Loading coil assembly. 5th October, 1956. (799513.)

30443. Heron, A. G.—Electrically heated flexible hoses. 22nd October, 1956. (799547.)

30631. Stone & Co. (Deptford), Ltd., J.—Electromagnetic carbon-pile regulators. 22nd October, 1956. (799770.)

31595. Standard Telephones & Cables, Ltd.—Computing apparatus. 4th November, 1955. (799793.)

33587. Morle, C. W. (Philco Corporation).—Colour television systems. 23rd November, 1955. (799940.)

33591. Philips Electrical Industries, Ltd.—Electronic counting devices. 23rd November, 1955. (799514.)

34635. Sylvania Electric Products, Inc.—Electrostatic lens structures in electron-discharge devices. 2nd December, 1955. (799533.)

35295. Telefonaktiebolaget L. M. Ericsson.—Oscillators. 8th December, 1955. (799885.)

35877. Westinghouse Electric International Co.—Starting circuits for electric-discharge lamps. 14th December, 1955. (799517.)

37270. General Electric Co.—Electrical resistance devices, with a non-linear voltage-current characteristic. 29th December, 1955. (799687.)

1956

162. Dunn, E. S.—Submersible motor. 3rd January, 1956. (799855.)

2223. Ericsson Telephones, Ltd.—Enclosed spark gaps. 18th February, 1957. (799880.)

3984. Landis & Gyr Akt.-Ges.—Automatic circuit breaking switch adjustable to different rated currents. 8th February, 1956. (Addition to 799510.) (799569.)

7476. Siemens & Halske Akt.-Ges.—Transistor oscillators. 9th March, 1956. (799690.)

7704. Napier & Son, Ltd., D.—Electric commutators. 26th February, 1957. (Addition to 796022.) (799570.)

8016. Siemens & Halske Akt.-Ges.—Pulse-timing systems. 14th March, 1956. (799691.)

10247. Union Carbide Corporation.—Primary galvanic cells. 4th April, 1956. (799716.)

12580. Sylvania Electric Products, Inc.—Cathode-ray tube. 24th April, 1956. (799992.)

12845. Philips Electrical Industries, Ltd.—Electrometers. 26th April, 1956. (799887.)

14700. Kimber, B. H.—Couplings for cables. 4th February, 1957. (799537.)

14748. Licentia Patent-Verwaltungs-Ges.—Method of making electric fuses with contact blades. 11th May, 1956. (799968.)

16218. Westinghouse Electric International Co.—Electrostatic precipitators. 25th May, 1956. (799809.)

16451. Sylvania Electric Products, Inc.—Method of producing phosphor patterns in cathode-ray tubes. 28th May, 1956. (799993.)

18220. Square D Co.—Control arrangements for electric motors. 13th June, 1956. (799849.)

18408. Research Corporation.—Electrostatic precipitator systems. 14th June, 1956. (799539.)

21812. Siemens & Halske Akt.-Ges.—Co-ordinate switching arrangements. 13th July, 1956. (Addition to 797913.) (799572.)

21819. Speer Carbon Co.—Electric resistors with integral moulded metal terminals. 13th July, 1956. (799970.)

22298. Sylvania Electric Products, Inc.—Colour television receiver. 18th July, 1956. (799853.)

23925. General Motors Corporation.—Electrical measuring instruments. 2nd August, 1956. (799961.)

24143. Triggs, W. W. (Kidde & Co., Inc., W.).—Thermostatic electric switch. 7th August, 1956. (799971.)

24980. Veb Grubenlampenwerke.—Batteries of alkaline accumulator cells. 15th August, 1956. (799648.)

25248. Hazeltine Corporation.—Oscillator for generating a saw-tooth wave. 17th August, 1956. (799542.)

26684. Western Electric Co., Inc.—Bistable electric circuits employing semiconductor devices. 31st August, 1956. (799560.)

26988. Clark Equipment Co.—Motor reversing switch. 4th September, 1956. (799649.)

27201. Midland Silicones, Ltd.—Electrical conductors. 5th September, 1956. (799698.)

28165. General Electric Co.—Electric discharge device electrode support member. 14th September, 1956. (799659.)

30763. Soc. des Accumulateurs Fixes et de Traction.—Deferred action primary electric batteries. 9th October, 1956. (799842.)

33373. Philips Electrical Industries, Ltd.—Overload couplings. 1st November, 1956. (799816.)

35303. Babcock & Wilcox Co.—Nuclear reactor and method of operating same. 19th November, 1956. (799725.)

36680. Standard Telephones & Cables, Ltd.—Intelligence processing equipment. 30th November, 1956. (799945.)

36726. Fernseh Ges.—Timebase circuits. 30th November, 1956. (800000.)

37379. Thorn Electrical Industries, Ltd.—Lighting fitting. 4th December, 1957. (Addition to 797765.) (799783.)

1957

2561. Rheostatic Co., Ltd.—Snap-action device. 24th January, 1957. (Addition to 774219.) (799728.)

6855. Fernseh Ges.—Circuits for frequency division. 1st March, 1957. (799918.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Antrim.—County Education Committee. 27th August. Electrical installation in Ballyclare Intermediate School. J. R. W. Murland, consulting engineer, 13, Wellington Place, Belfast.

Australia.—Brisbane City Council. 22nd August. Lightning arrestors. (E.S.B. 17636/58. Ten/33892.)*

Southern Electricity Authority of Queensland, Brisbane. 4th September. 33 kV oil-filled cables and accessories. (E.S.B. 19641/58. Ten/33907.)* 24th September. Five 33 kV outdoor-type automatic step voltage regulators. (E.S.B. 19642/58. Ten/33912.)*

Director, Stores and Contracts, Postmaster-General's Department, Melbourne. 30th September. Transmitting and rectifying tubes. (E.S.B. 19633/58. Ten/33931.)* 9th October. Electronic test equipment. (E.S.B. 19155/58. Ten/33852.)* 14th October. High frequency test equipment. (E.S.B. 19156/58. Ten/33848.)* 21st October. Testing instruments for research laboratories. (E.S.B. 19632/58. Ten/33932.)*

Western Australian Government Tender Board, Perth. 30th October. Two 5,000 kVA transformers. (E.S.B. 17657/58. Ten/33878.)*

Brentwood. — U.D.C. 1st September. Refrigerators. (See this issue.)

Burma.—Burma Purchase Board, Rangoon. 26th August. 900 car batteries. (E.S.B. 19955/58. Ten/33968.)*

Carrickfergus (Co. Antrim).—29th August. Electrical installation in proposed extensions to St. Nicholas Primary Schools. C. McNally, consulting engineer, 143, Royal Avenue, Belfast.

Chesham.—U.D.C. 5th September. Street lighting equipment. (See this issue.)

Coulsdon and Purley.—U.D.C. 27th August. Street lighting equipment. (See this issue).

Durham.—County Council. 22nd August. Equipment and machinery for the engineering workshops at Durham Technical College. G. H. Metcalfe, director of education, Shire Hall.

Edinburgh.—North of Scotland Hydro-Electric Board. 132 kV power and auxiliary cables. (See this issue.)

Formosa.—Central Trust of China, Taipei. 26th August. Thirteen steam generating units. (E.S.B. 17683/58. Ten/33874.)* 28th August. Six steam turbine generators with distribution equipment and accessories. (E.S.B. 17649/58. Ten/33919.)*

Greece. — State Procurements Service, Athens. 23rd August. Telephone material and apparatus. (E.S.B. 19608/58. Ten/33891.)*

Hendon.—Borough Council. 22nd August. Electrical fittings (schedule No. 6) for the period ending 30th September, 1959. Borough engineer, Town Hall, Hendon, N.W.4.

India.—Madras State Electricity Board. 24th September. H.v. and l.v. cables and cable boxes. (E.S.B. 19586/58. Ten/33910.)*

Iran.—Plan Organisation, Teheran. 1st September. Electrification of the towns of Eghlide and Abarghou. (E.S.B. 19681/58. Ten/33947.)*

Korea.—Government Office of Supply, Seoul. 27th August. Radio transmitters and spare parts. (E.S.B. 18218/58. Ten/33841.)*

Manchester.—Housing Committee. 27th August. Electrical installations in dwellings. (See this issue.)

New Zealand.—G.P.O., Wellington. 27th August. Telephone cable. (E.S.B. 19571/58. Ten/33904.)*

Pakistan.—Government Department of Supply and Development, Chittagong. 22nd September. Diesel generator arc welding sets, diesel electric generators and spare units. (E.S.B. 19602/58. Ten/33909.)*

Rhodesia and Nyasaland.—Federal Tender Board, Causeway. 22nd August. Open wire circuit line carrier terminals. (E.S.B. 19196/58. Ten/33884.)* 29th August. Line carrier equipment. (E.S.B. 17611/58. Ten/33930.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 3rd September. Electric cable and sealing ends. (E.S.B. 19627/58. Ten/33895.)*

Johannesburg City Council. 28th August. 11 kV switch fuse and isolator units. (E.S.B. 19587/58. Ten/33896.)*

South West Africa. — Municipality of Otjiwarongo. 10th September. Switchboards, 11 kV and l.v. cable and accessories, one 300 kVA transformer and line material. (E.S.B. 19620/58. Ten/33908.)*

Turkey.—P.T.T., Ankara. 24th August. Coaxial, high frequency and voice frequency cables and loading coils. (GD/5725/58. Ten/33894.)*

Tyrone.—County Education Committee. 17th September. Electrical installation in Aughnacloy Secondary Intermediate School and meals kitchen. J. McCandless, consulting engineer, 6, Murray Street, Belfast.

Wembley.—Borough Council. 3rd September. 250 group "A" and 20 group "B" sodium discharge street lighting units, together with ancillary equipment. Borough engineer, Town Hall.

ORDERS PLACED

London. — Woolwich Borough Council. Recommended. Electrical installation work at the Bostall estate (£11,130).—London Electricity Board.

Manchester.—Regional Hospital Board. Recommended. Rewiring of Leigh Infirmary (£7,174).—F. L. Bampton. Rewiring work at Birch Hill Hospital, Rochdale (£3,295).—Frank Wall & Co.

Housing Committee. Electrical installation work in 331 dwellings at Hazel Grove and Bramhall.—Sadler & Kinsey.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Abbots Langley.—Dwellings (28), Rosehill estate, Gallows Hill; Erno Goldfinger, architect, 69/70, Piccadilly, W.1.

Acton.—Works, Stirling Road and Bollo Lane; Decra, Ltd., 11, Hanbury Road.

Birmingham. — School at Manor Farm estate, Northfield (£64,600); A. G. Sheppard Fidler, city architect, Civic Centre, 1.

Blocks of offices, Edgbaston; John H. D. Madin, architect, 83, Hagley Road, Birmingham, 16.

Blaydon-on-Tyne.—Conversion of cinema at Blackhall Mill into workmen's social club; J. M. Angus, architect, 3, Gallowgate, Newcastle-on-Tyne.

Bradford.—Additional laboratory accommodation at the Institute of Technology (£25,500); erection of industrial centre; Holme Junior and Infants' School; W. Clifford Brown, city architect.

Brighton.—Three-storey block at Brighton College, Eastern Road; Clayton, Black & Partners, architects, 10, Prince Albert Street, Brighton, 1.

Cambridge.—Buildings for Department of Experimental Psychology, University of Cambridge; Kidman & Sons, Ltd., builders, 64, Victoria Road.

Dunfermline.—Secondary school at Shields Road (about £300,000); R. S. Lawrie, Fife county architect, County Buildings, Cupar.

Durham.—Houses (200), Carrville; F. W. Rought & Son, builders, High Street West, Sunderland.

Proposed fire stations at Aycliffe and Crook, and second stages of new fire stations at Durham and Consett; county architect, South Street, Durham.

Ellesmere Port.—Church, Blue Vase Road; Cartwright Bros., Ltd., builders, Little Sutton, Wirral.

Leicester.—Improvements, Wycliffe Secondary Modern School and Gateway Boys' School (£80,320); city architect.

London.—Office block, 2, Pudding Lane, E.C.; David Landaw & Partners, architects, 164, Bishopsgate, E.C.2.

Shops and offices, Queen Street and Charles Street, Mayfair; Holland & Hannen and Cubitts, Ltd., 1, Queen Anne's Gate, S.W.1.

Multi-storey car park, Audley Square and Waverton Street, S.W.; Frank Risdon, architect, 47, Bedford Row, W.C.1.

Flats (163), Hide Place, S.W.; Stillman & Eastwick Field, architects, 30, John Street, W.C.1.

Flats (71), Graham Road/Wilton Way site, Hackney; borough engineer, Town Hall, E.8.

Maidstone.—Two-storey banking hall and offices on site of Regal Cinema, Earl Street; London Trustee Savings Bank, Fleet Street, E.C.4.

Scarborough.—Technical school, Scalby Road (£355,000); Gollins, Melvin, Ward & Partners, architects, 15, Manchester Square, London, W.1.

Swansea.—Hotel and shops, The Kingsway; Calgary & Edmonton Land Co., Ltd., 43, Wimpole Street, London, W.1.

Tunbridge Wells.—Factory for Systematic Tooling, Ltd. (£70,000); A. Roberts & Co., Ltd., builders, 79, Eccleston Square, London, S.W.1.

Mixed secondary school at Sandown Park; E. T. Ashley-Smith, county architect, Springfield, Maidstone.

Twickenham.—Three-storey shops and offices, Church Lane area; borough engineer, Municipal Offices.

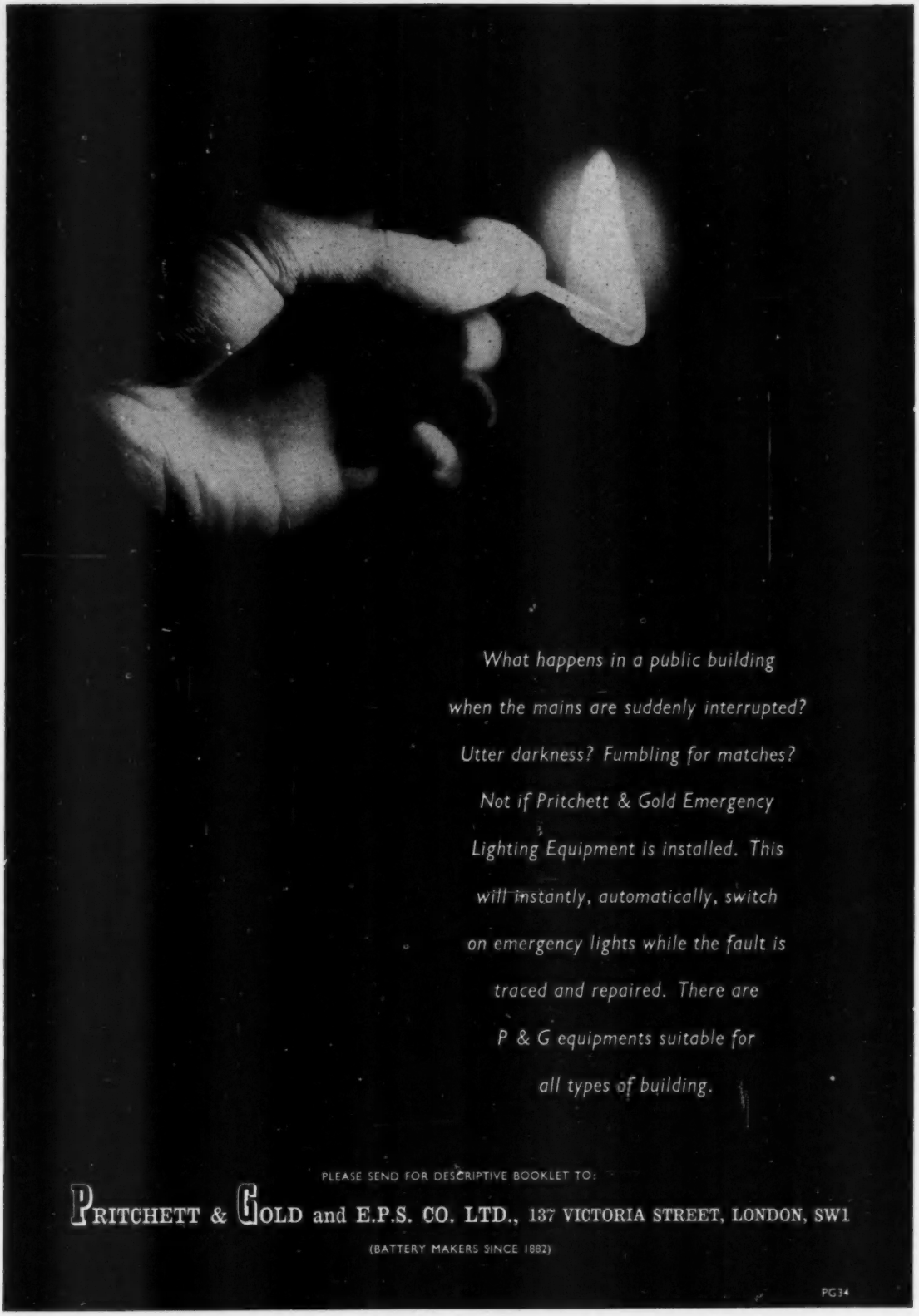
Watford.—Printing department at the Technical College (£144,695); C. H. Aslin, Herts. county architect, County Hall, Hertford.

West Hartlepool.—Houses (130), Brooke estate; C. M. Yuill, Ltd., builders, Villiers Street, West Hartlepool.

Windsor.—Flats (48), Dedworth; borough engineer, Kipling Memorial Building.

Wolverton.—Final instalment of College of Further Education and new Radcliffe School (£403,315); county architect, Buckingham.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).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Utter darkness? Fumbling for matches?
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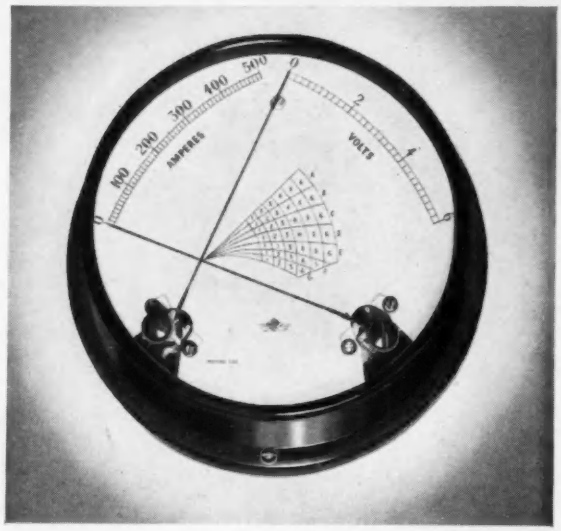

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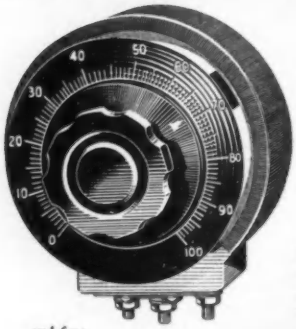

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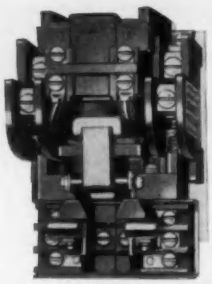
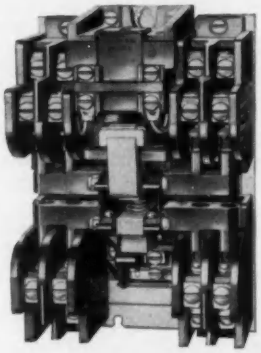


● 2-pole Open Style Relay with two changeover coil circuit contacts.



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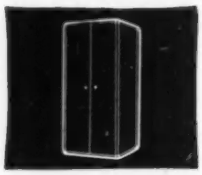

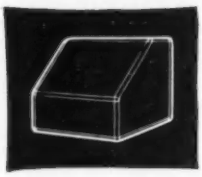

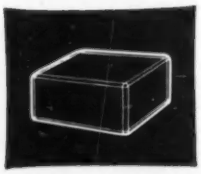

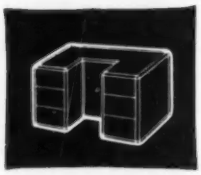

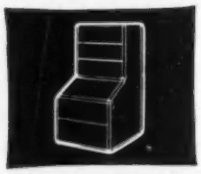

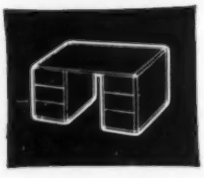

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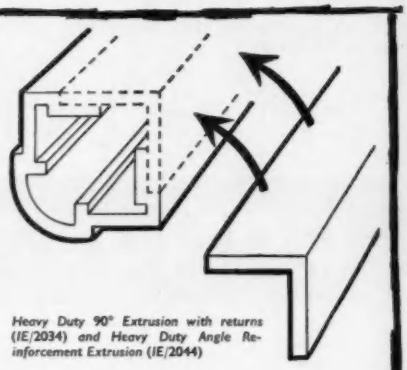
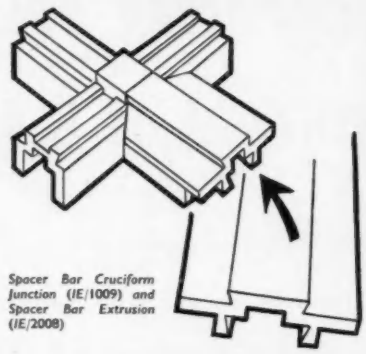
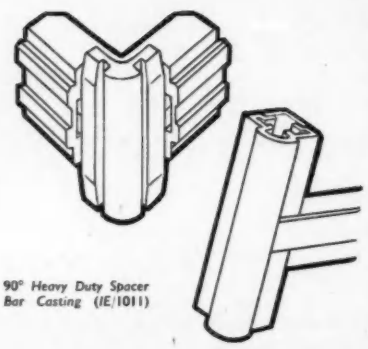


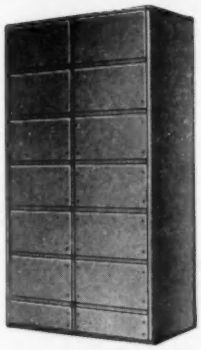
Heavy Duty 90° Extrusion with returns (IE/2034) and Heavy Duty Angle Reinforcement Extrusion (IE/2044)



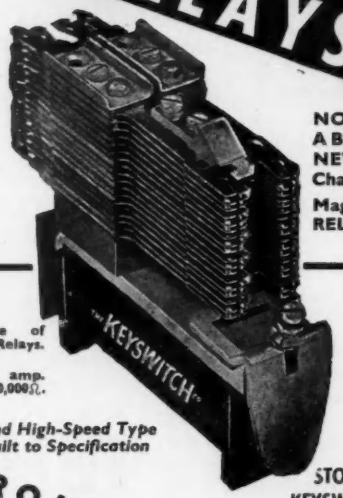
Spacer Bar Cruciform Junction (IE/1009) and Spacer Bar Extrusion (IE/2008)



90° Heavy Duty Spacer Bar Casting (IE/1011)



RELAYS



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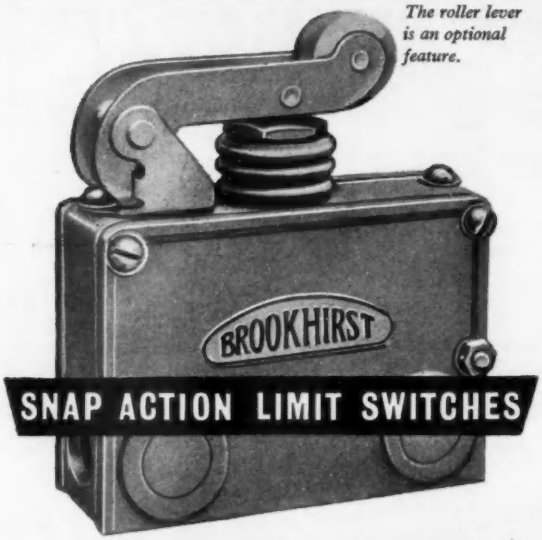

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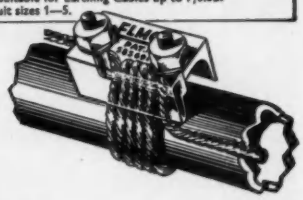
to fit B.S. conduit sizes i.e. in trade terms	1, 2 & 3 ⅜" to ¾"	4 & 5 1" and 1½"	6 & 7 1½" and 2"	8, 9 & 10 2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



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Made in zinc base alloy in the following sizes

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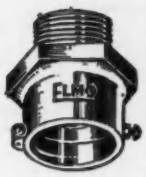
Inside Diameter	⅜"	½"	1"	1¼"	1½"	2"
Electric Thread (Male)		⅜"	½"	¾"	1"	1¼"
Inside Diameter Flexible Conduit		⅜"	½"	¾"	1"	



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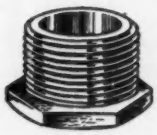

MALE
Hex. Section

CONDUIT BUSHES

Made in the following sizes:

MALE: Electric Thread
⅜" ½" 1" 1¼" 1½" 2"

FEMALE: Electric Thread
⅜" ½" 1" 1¼" 1½" 2"

FEMALE
Flat Face Section for Spanner (except ⅜" size, which is round)

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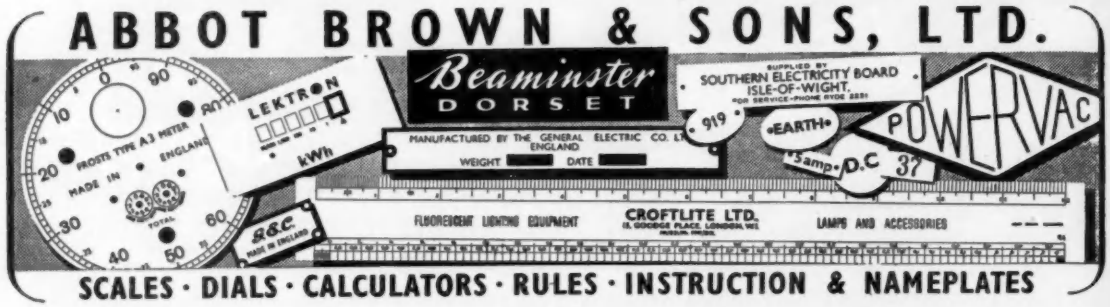

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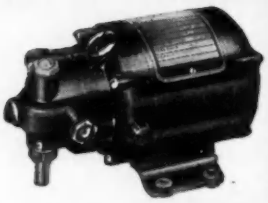

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R.P.M.	TORQUE	R.P.M.	TORQUE
600	10 oz. in.	37.5	4 lb. in.
300	16 oz. in.	25	4 lb. in.
150	24 oz. in.	18.8	4 lb. in.
100	32 oz. in.	12.5	4 lb. in.
75	36 oz. in.	9.4	4 lb. in.
50	3 lb. in.	6.25	4 lb. in.

SHADED-POLE INDUCTION GEARED MOTOR—Type 'FA'

R.P.M.	TORQUE	R.P.M.	TORQUE
216	4 oz. in.	13.5	24 oz. in.
108	7 oz. in.	9	30 oz. in.
54	10 oz. in.	6.7	35 oz. in.
36	12 oz. in.	4.5	44 oz. in.
27	15 oz. in.	3.35	3 lb. in.
18	20 oz. in.	2.25	4 lb. in.

VARIABLE SPEED GEARED MOTOR—Type 'KQ'

R.P.M.	TORQUE	R.P.M.	TORQUE
200-600	9 oz. in.	12-37.5	4 lb. in.
100-300	16 oz. in.	8-22	4 lb. in.
50-150	20 oz. in.	6-16.5	4 lb. in.
32-100	32 oz. in.	4-11	4 lb. in.
25- 75	40 oz. in.	3- 8.25	4 lb. in.
16- 50	48 oz. in.	2- 5.5	4 lb. in.

CAPACITOR INDUCTION GEARED MOTOR—Type 'N'

R.P.M.	TORQUE	R.P.M.	TORQUE
456	8 oz. in.	28.5	3 lb. in.
228	13 oz. in.	19	4 lb. in.
114	21 oz. in.	14.2	4 lb. in.
76	26 oz. in.	9.5	4 lb. in.
57	32 oz. in.	7.1	4 lb. in.
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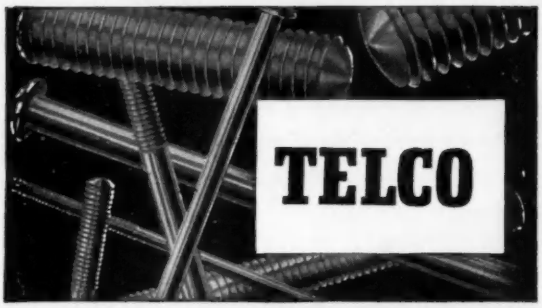

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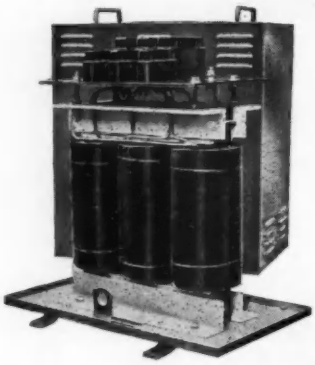

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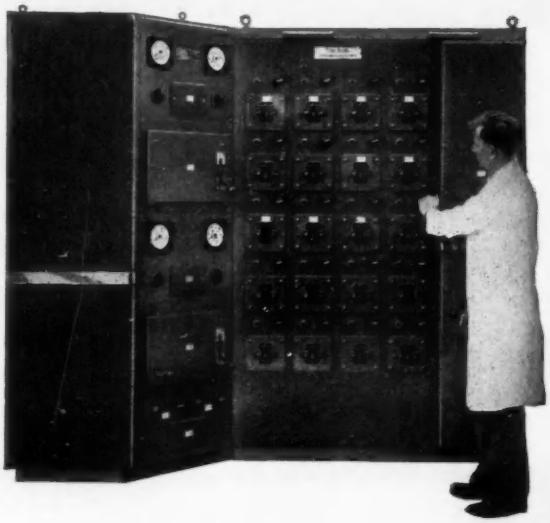

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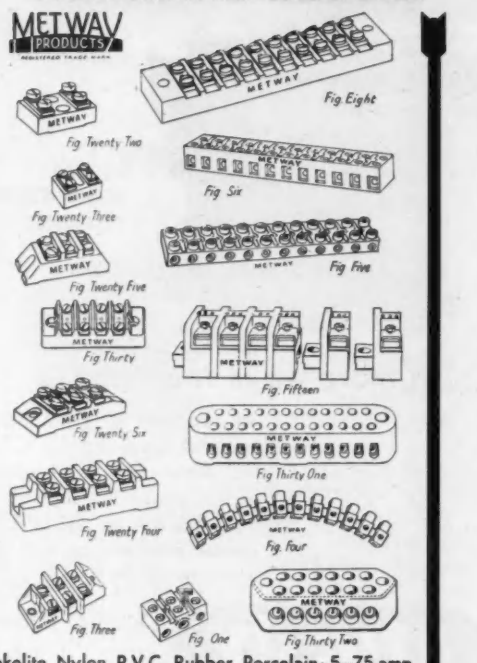

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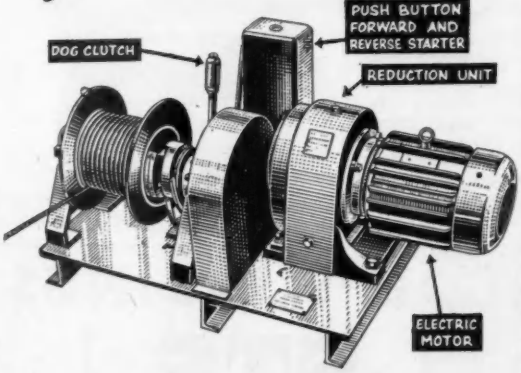

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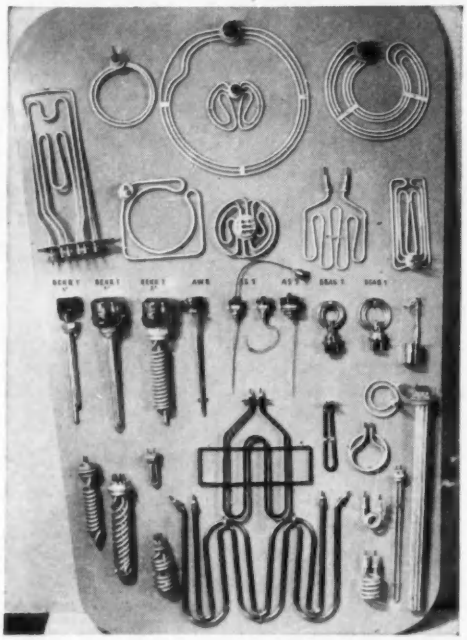

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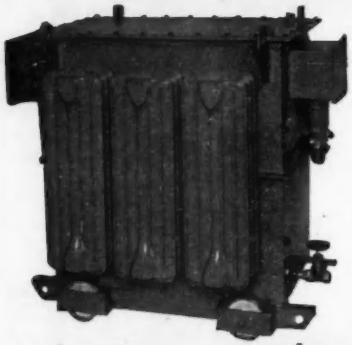

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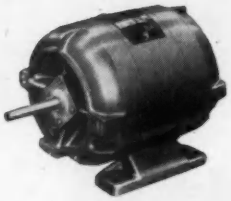

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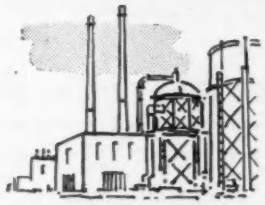

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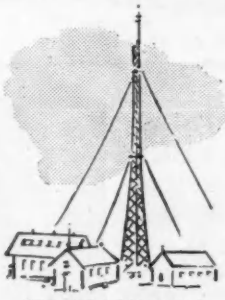

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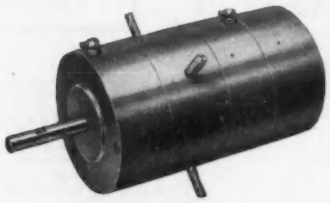

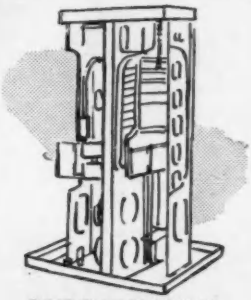

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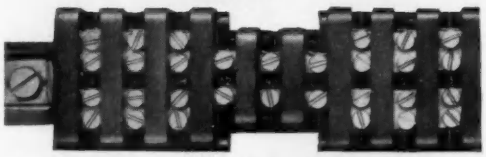

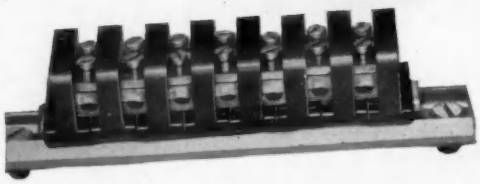

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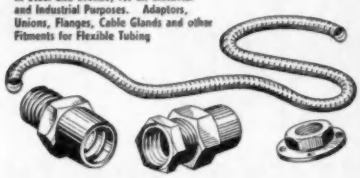

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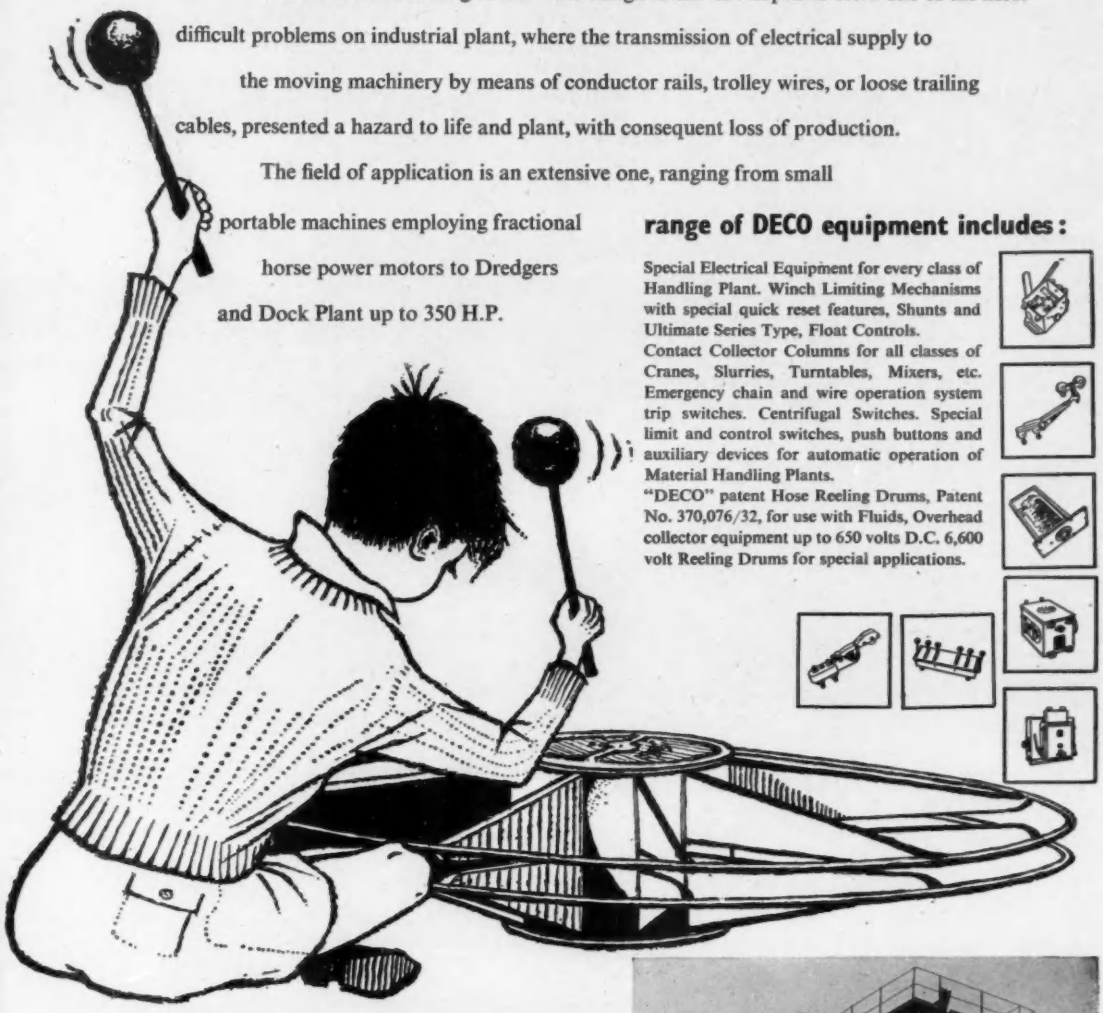

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An illustration of a counter-weight operated radial reeling drum accommodating 130 feet of 4-core 1.3" overall diameter reinforced trailing cable for a 40-ton Goliath crane. (Photograph by kind permission of Messrs. Stothert & Pitt Ltd.)

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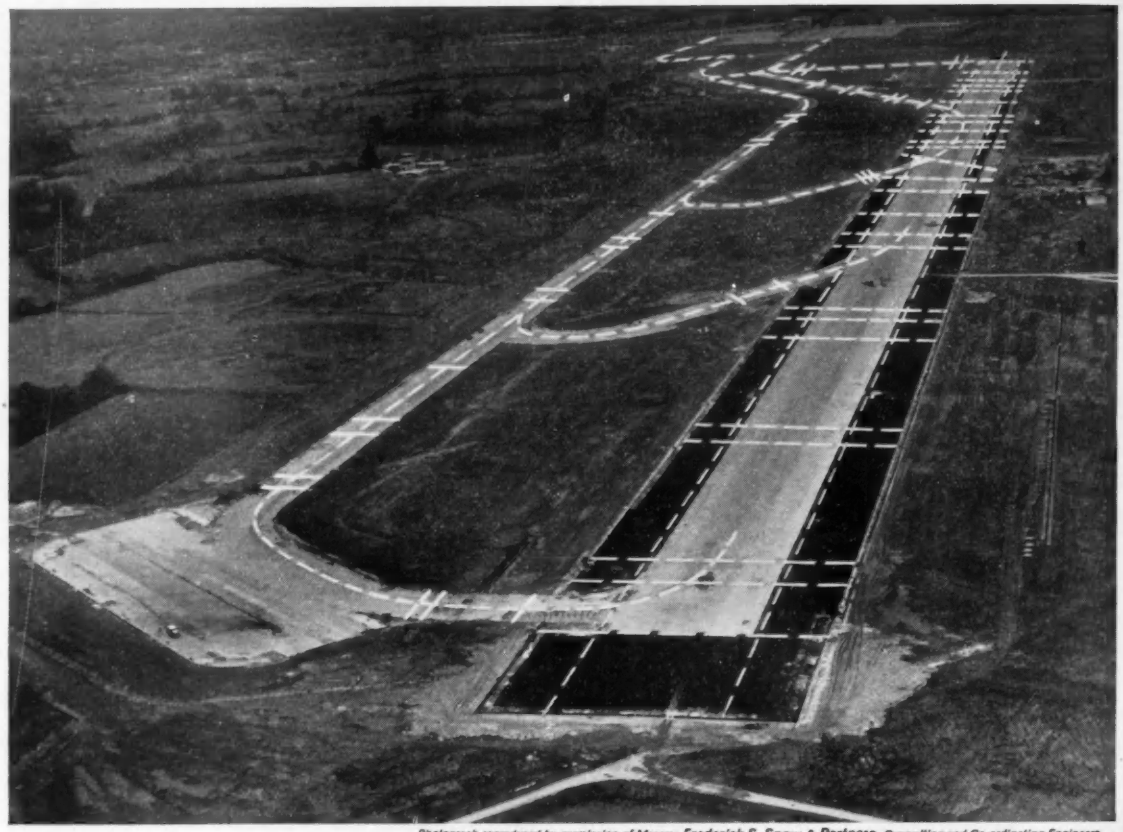

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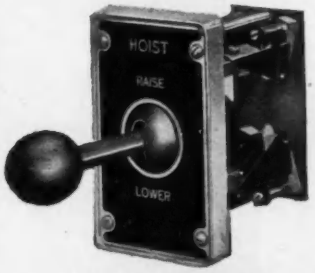

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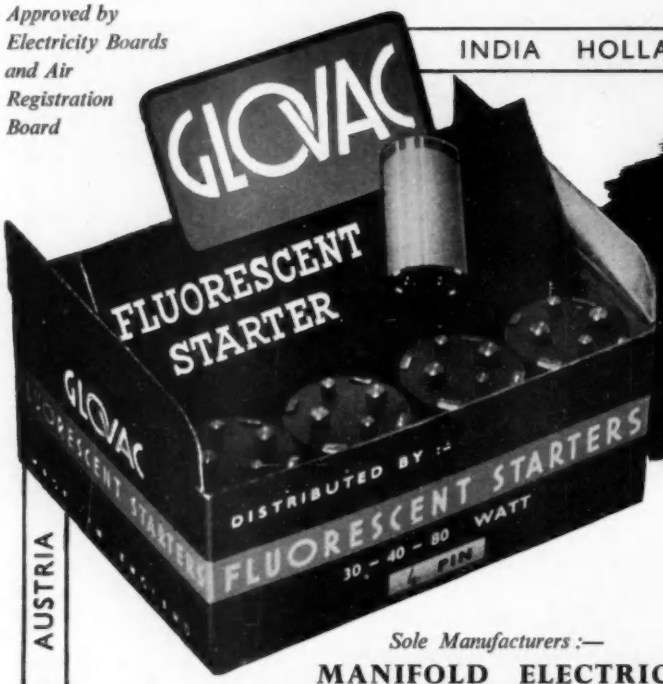

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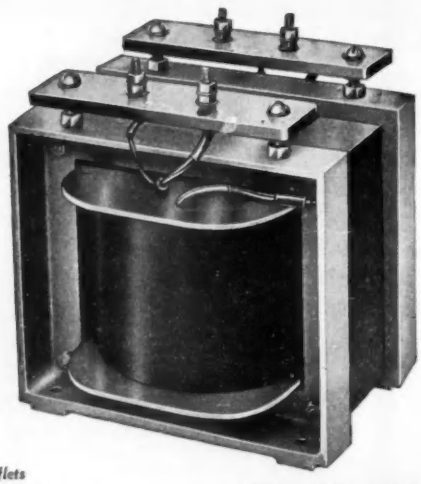

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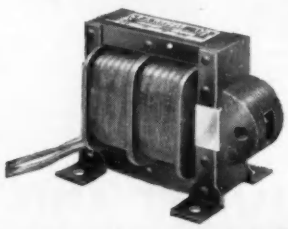

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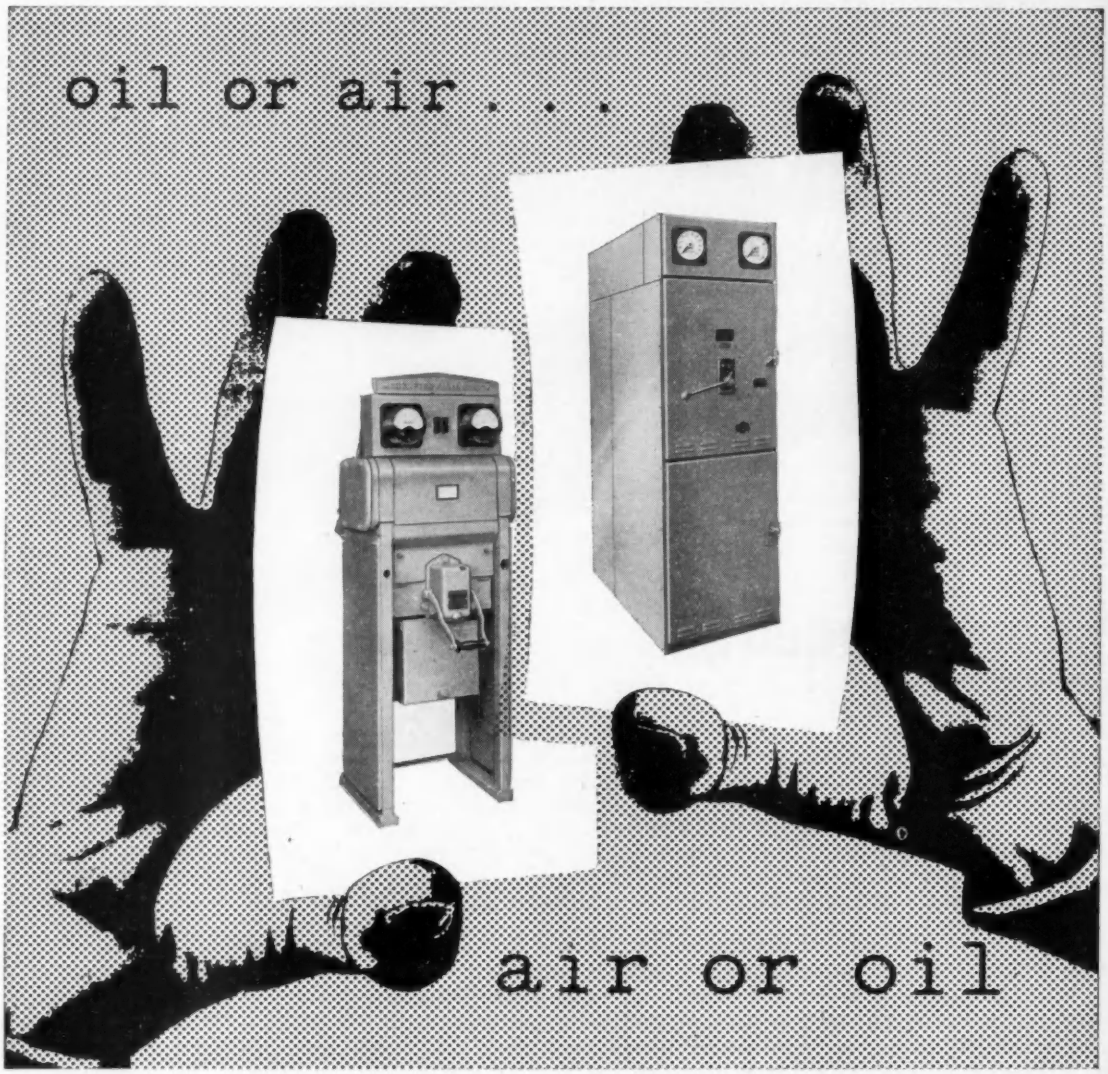

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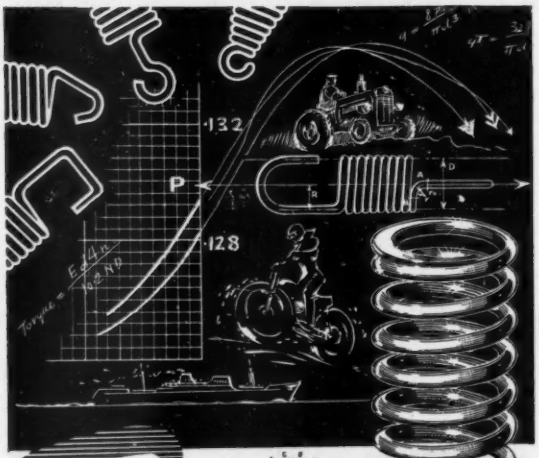

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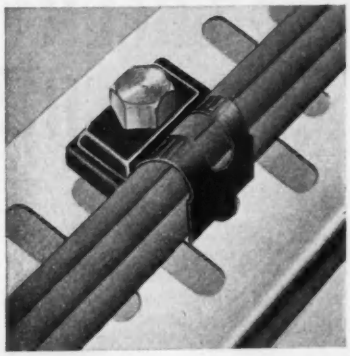

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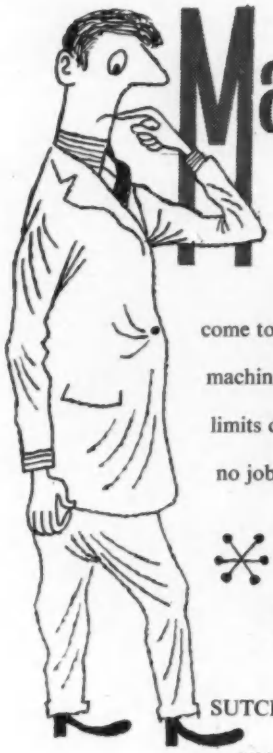
Telephone: Wythenshawe 2842 & 3163



May we do your pressing?

For hot pressings and stampings—accurate well-finished and of consistently high quality—come to Sutcliffe Speakman. We undertake machining where necessary and can work to limits down to .0005". No quantity is too large, no job too complicated, no standard too exacting.

In all non-ferrous alloys including aluminium, brass, chromium copper, cadium copper, manganese bronze and nickel silver. Also castings in gun-metal, phosphor bronze and heat-resisting nickel chrome alloys.

SUTCLIFFE SPEAKMAN

SUTCLIFFE SPEAKMAN AND CO. LIMITED · *Leigh, Lancashire* · *Telephone: Leigh 94*

LONDON OFFICE: CAXTON STREET WESTMINSTER S.W 1. TELEPHONE: ABBEY 3085

MERCURY SWITCHES

THE MERCURY SWITCH MANUFACTURING COMPANY LIMITED are the largest specialised manufacturers of Mercury Switches in Great Britain. These are made to exceptionally high and uniform standards of quality.
Since its inception in 1932, *this Company has concentrated solely on the production of Mercury Switches. It has thereby obtained the widest possible experience and expert knowledge of design, manufacture and application.*

THE MERCURY SWITCH MANUFACTURING CO. LTD.
WEST DRAYTON - MIDDX.

MS11

MIDLAND METALLICS LIMITED

LIMITED

Siddons Factory Estate, Howard Street, Hilltop West Bromwich, Staffs. *Phone: WEDNESBURY 1489*

Gravity and Pressure Diecastings
of PRECISION
QUALITY and DISTINCTION
In Aluminium and Zinc Base Alloys

PLASTIC CABLE CLIPS

The Cable Clip is designed to 'push fit' on to the cable.
The carbon steel pin is already part of the unit and will drive into wood, plaster or mortar.

HIATT & CO. LTD. Baltimore Road Birmingham 22B

INSULATING VARNISHES

Throughout the electrical industry Sterling Insulating Varnishes are renowned for their superior quality, whether they be of the stoving or air-drying types.
So much depends on the Varnish.
Be sure you have the best—it's cheaper in the long run.
For over 60 years Sterling have been serving the Electrical Industry throughout the world.

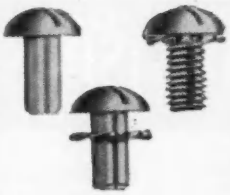
THE STERLING VARNISH COMPANY LIMITED
Fraser Road, Trafford Park, Manchester 17
Telephone: Trafford Park 0282 (4 *lines*)
Telegrams: " DIELECTRIC MANCHESTER "
London Office and Warehouse : 6 London Road, Brentford Middlesex. Telephone : Ealing 9152

MADE BY CHEMISTS
Sterling
INSULATING VARNISHES
SERVICED BY ENGINEERS

dm ST 17

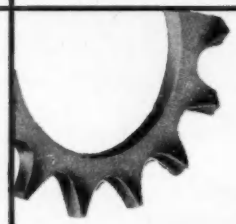
Why pre-assembled lockwashers and screws?

Placing lock washers on screws takes time—costs money.
SEMS eliminate this.



With SEMS the washer and screw are supplied as a manufactured unit, cut handling, assembly costs.

With SEMS, washers are held on by the screw's rolled threads. Washer losses are eliminated.



SEMS washers fit closer under head, tapered twisted teeth lock tighter.

SEMS

Registered Trade Mark

PRE-ASSEMBLED "SHAKEPROOF" LOCK-WASHER & SCREW UNITS

BARBER & COLMAN LIMITED
BROOKLANDS • SALE • CHESHIRE

"SHAKEPROOF" PRODUCTS

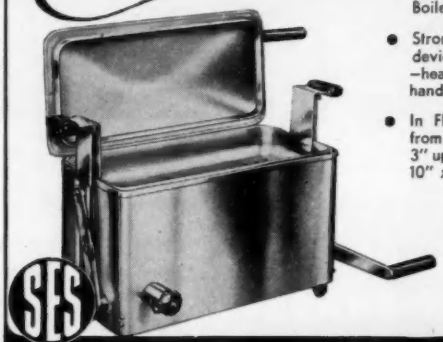
SHAKEPROOF & LOCK WASHERS
SHAKEPROOF THREAD CUTTING SCREWS
SHAKEPROOF SEMS

SURQUAL

AUTOMATIC STERILIZER

For Efficient Sterilization

- With Automatic Heat Control and Cut-out.
- Seamless Reinforced Boiler.
- Strong lifting device for tray —heat insulated handles.
- In FIVE SIZES from 9" x 5" x 3" up to 20" x 10" x 7".



SES

SURGICAL EQUIPMENT SUPPLIES LTD
WESTFIELDS ROAD, LONDON, W.3
Name of Local Dealers on request

THE MERITUS

HIGH CURRENT NEUTRAL LOOP IMPEDANCE AND CONTINUITY TESTER

SHOCKPROOF AND SAFE FOR OPERATOR AND INSTRUMENT

This instrument will SAFELY carry out tests on electrical installations and appliances as recommended in the I.E.E. Regulations, 13th Edition, 1955, Section 5.

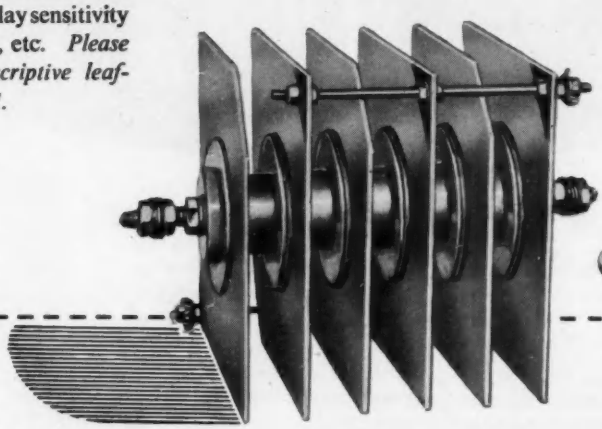
MERITUS (BARNET) LTD.
BARNET, HERTS. **Bar. 2291/2**

METROSIL

Non-linear Resistors

$I \propto V^4$

Metrosil non-linear resistors provide a reliable means of safeguarding all types of electrical equipment against surge voltages. A rise in voltage to twice the normal value increases the current approximately twenty times. Based on silicon carbide, Metrosil is usually made in the form of discs, but rods are also produced for certain applications. These standard products are stable and convenient in size, standard discs ranging from $\frac{3}{8}$" to 6" in diameter. Typical applications for Metrosil products include the protection of field coils, relay coils and solenoids, instrument relays, condensers, tap-changing switches and power transmission lines. Other applications include spark quenching, protection of instruments under fault conditions, relay sensitivity improvement, etc. *Please write for descriptive leaflet No. 220/1-1.*



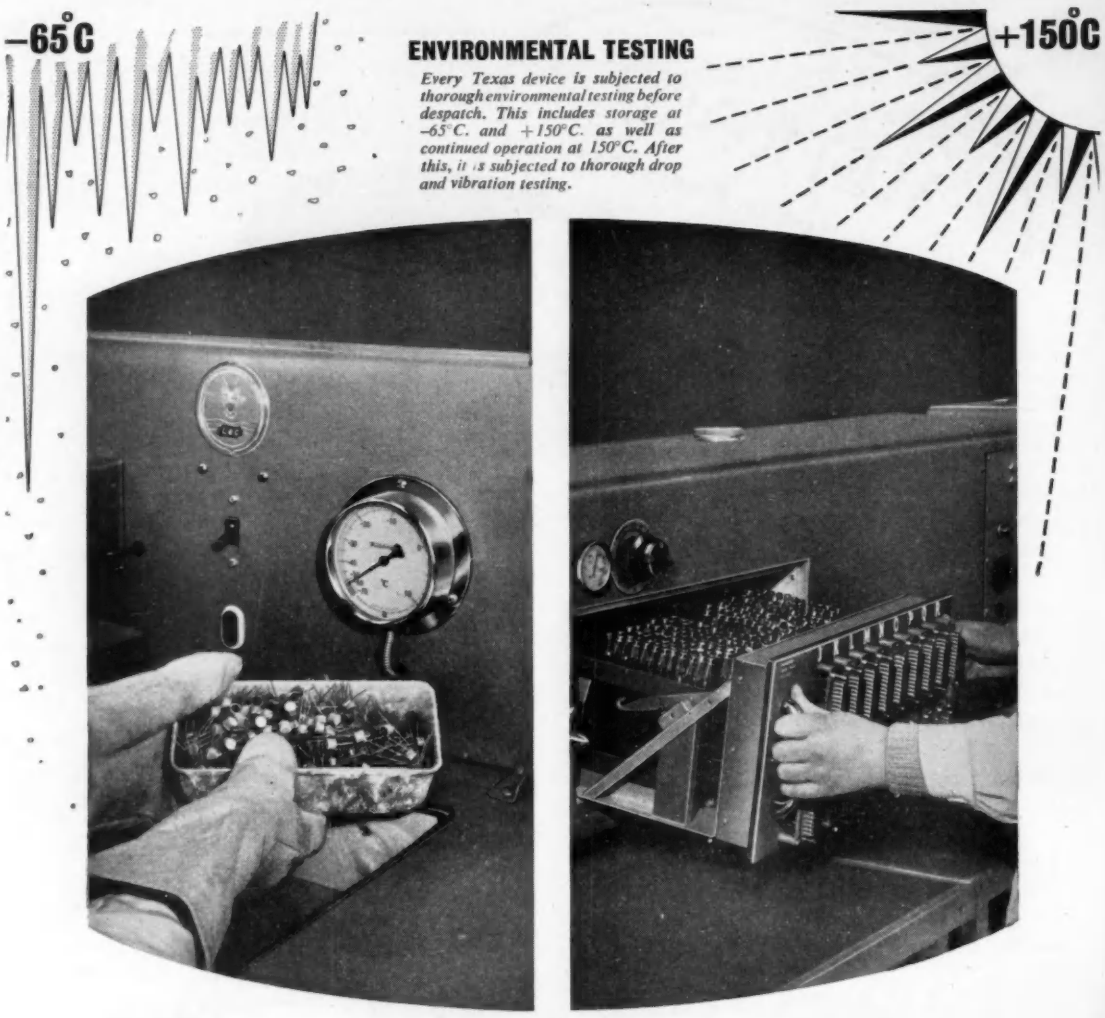
METROPOLITAN-VICKERS

ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

A New Circuit Component

NM/501



ENVIRONMENTAL TESTING

Every Texas device is subjected to thorough environmental testing before despatch. This includes storage at –65°C. and +150°C. as well as continued operation at 150°C. After this, it is subjected to thorough drop and vibration testing.

NEW 4 WATT POWER TRANSISTOR

THE NEW TEXAS medium power transistor with a collector dissipation of 4 watts makes possible a high degree of miniaturisation of servo amplifiers. For example a pair in Class 'B' push-pull operating from a 36 volt supply gives 4 watts output, sufficient to drive a size 10 servo motor at full torque.

Additional important features of these new devices are: a minimum alpha cut-off frequency of 4 Mc/s, collector voltages of 60 for the 2S017 and 100 for the 2S018, and a maximum storage temperature of 200°C.

Circuit design information on these and other Texas power transistors is provided in our Application Report on servo amplifier design.

ACTUAL SIZE

TEXAS INSTRUMENTS LIMITED

Pioneers of Semiconductors

DALLAS ROAD, BEDFORD. TEL: BEDFORD 68051 CABLES: TEXINLIM BEDFORD

T.15

AEROFLEX
Fluvent

CABINET STYLE DISTRIBUTION BOARDS WITH ISOLATING SWITCHES

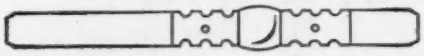
Widespread acceptance of Fluvent Cabinet Style Boards has resulted in production of a Switch of similar exterior. Intended principally for use as control switches mounted in conjunction with the boards, 30 and 60 amp. sizes are available with S.P. and neutral link as an alternative to D.P. (in the same dimensions as D.P.), and T.P. with neutral link (in the same dimensions as T.P.).

UNOBTRUSIVELY EFFICIENT

Both boards and switches have pressed steel cabinets which are cadmium plated and painted to give a grey metallic hammer finish. All edges are rounded to a uniform radius, the lid is sunk flush and the hinges invisible. Maximum accessibility is ensured by the door swing which is almost 180°.

WITH Aeroflex ENERGY LIMITING FUSES

Cabinet Style Distribution Boards are fitted with Aeroflex Energy Limiting High Breaking Capacity Cartridge Fuse Links to British Standard No. 88, 1952, 46 K.A. Breaking Capacity on 440 volts, with 1.25 fusing factor. Standard fully wired cartridge fuse links are included unless otherwise specified, when appropriate underwirings can be fitted. Fuse links are not discarded when blown — they can be returned for prompt replacement under our rewiring service scheme.



✱ *The latest type of Aeroflex fuse element as employed in the AD and FC type Energy Limiting Fuses.*

Parmiter Hope & Sugden Ltd

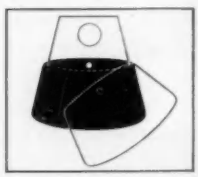
FLUVENT ELECTRICAL WORKS MANCHESTER 12

London: 34 Victoria Street, S.W.1. *Glasgow:* 5 Somerset Place, C.3 *Birmingham:* 39/41 Carrs Lane, 4

rest diffuser on ledges, tighten locking screws, *and presto...*

Discreet diffused fittings for the Chairman's office. 'Perspex' or Steel reflectors for the factory. Handsome glazed units, for shops or stores. Dozens of different designs, decorative or strictly functional. Sizes from 1½ ft. to 8 ft. single or twin lights.

The range is wide, the choice is yours—but one thing they will all have in common is the G.E.C. basic channel—the basis of a hundred and one different light fittings. Economical to install, simple to fit, easy to maintain—the brilliantly successful '101' range—the reality of a complete lighting service. Send for profusely illustrated catalogue.



it's so simple with G.E.C. range 101 fluorescent fittings

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to First Post on Monday of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

CHESHAM URBAN DISTRICT COUNCIL

Public Lighting, A.416

TENDERS are invited for the supply and erection of 61 Steel Group A Lighting Columns fitted with 250-watt Colour Corrected Mercury Vapour Lanterns, with all lamps and control gear.

Specifications and bills of quantities may be obtained and conditions of contract and layout drawings inspected at the office of the Engineer and Surveyor to the Council on payment of £1 1s. deposit, which will be returned on receipt of a bona fide tender.

Tenders in plain sealed envelopes bearing the words "Street Lighting A.416" must be received by me not later than Friday, the 5th September, 1958.

The Council do not bind themselves to accept the lowest or any tender.

W. I. NASH,
Clerk to the Council.

Council Offices,
Chesham, Bucks. 4445

BOROUGH OF STAMFORD

Street Lighting

TENDERS are invited for installing 57 Concrete Columns for Group "B" Street Lighting in various streets within the Borough.

Specification and form of tender may be obtained on application to the Borough Surveyor, Town Hall, Stamford, Lincs., upon payment of a deposit of £2 2s., which is returnable on receipt of a bona fide tender. Tenders, in plain sealed envelopes, endorsed "Tender for Street Lighting," should reach the undersigned not later than 10 a.m. Monday, 1st September, 1958.

The Council do not bind themselves to accept the lowest or any tender.

H. BEDFORD,
Town Clerk.

Town Hall,
Stamford, Lincs.
31st July, 1958. 4395

CITY OF MANCHESTER

Housing Committee

TENDERS invited (returnable noon 27th August, 1958) for Electrical Installations on the following contracts:—

Contract 257: Partington	170 dwellings
Contract 275: Crosby Farm, Victoria Ave. East	19 dwellings
Contracts 272 and 302: Blackley	9 dwellings
Contract 304: Moston	10 dwellings

Documents available from Director of Housing, Town Hall, Manchester, 2. 4466

BRENTWOOD URBAN DISTRICT COUNCIL

Refrigerators

TENDERS are invited for the supply and delivery of 100 Refrigerators.

(a) 1½ cu. ft. capacity.
(b) 2½ " "
(c) 3 " "

Tenders in a plain envelope endorsed "Refrigerators," addressed to the Clerk of the Council, Council Offices, Brentwood, to be received not later than 1st September, 1958. 4453

URBAN DISTRICT COUNCIL OF COULSDON AND PURLEY

New Sodium Lighting Schemes

TENDERS invited for provision and erection of 129 Concrete Lighting Columns and provision and fixing of 140-watt Sodium Lamps and Lanterns in Chipstead Valley Road, Coulsdon; Foxley Lane, Purley; and Farley Road, Selsdon, and the removal of existing street lighting equipment.

Specification, bills of quantities and forms of tender from H. M. Collins, Engineer and Surveyor, at address below, upon payment of deposit of £4 4s., which will be refunded upon receipt of a bona fide tender and return of documents.

Plans and conditions of contract may be inspected at the office of the Engineer and Surveyor.

Sealed tenders to the undersigned by first post, 27th August, 1958.

The Council do not bind themselves to accept the lowest or any tender.

ERIC F. J. FELIX,
Clerk of the Council.

Council Offices,
Purley, Surrey. 4428

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Charleston-Glenagnes Reinforcement

132-kV Power and Auxiliary Cables for Dundee

TENDERS are invited for the supply and laying of 132-kV Power and Auxiliary Cables between Elmwood Road and Glenagnes Substation within the Dundee city boundary.

Tender documents may be obtained from the Chief Electrical and Mechanical Engineer, North of Scotland Hydro-Electric Board, 16, Rothesay Terrace, Edinburgh, 3, on receipt of a deposit of two guineas (returnable).

The Board do not bind themselves to accept the lowest or any tender. 4465

SITUATIONS VACANT

ROTATING ELECTRICAL MACHINE DESIGNER

THE HARLAND ENGINEERING CO. LTD., ALLOA, have a vacancy for a young engineer possessing University Degree or good H.N.C. and with several years' rotating electrical machine design experience. In addition to specialist products the work covers approx. range 100 to 10,000 h.p./kW, both A.C. and D.C. 5-day week. Good contributory pension scheme.

Applications, which will be treated in strict confidence, should state age and give full details of training, experience, qualifications and salary desired.

Write to Personnel Manager.

4457

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER required at Chester. Salary within range £935/£995 per annum (N.J.B. G/7).

Applicants should have had experience in the construction and operation of E.H.T., H.T. and L.T. overhead and underground distribution systems, including indoor and outdoor substation equipment. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, should be returned not later than 25th August, 1958. 4432

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

(1) Second Assistant District Engineer (Lanark District)
(2) Third Assistant Engineer (Test)
(3) Fourth Assistant Engineer (Test)

APPLICATIONS are invited for the above appointments. Applicants should possess the necessary technical qualifications and have had a sound engineering training. The salaries and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A; the present classifications, gradings and salaries will be as stated below. The posts are superannuable subject to satisfactory evidence of health.

(1) SECOND ASSISTANT DISTRICT ENGINEER (Lanark District).

Candidates should have had experience in operation and maintenance of H.V. and L.V. overhead and underground distribution systems including H.V. fault location. They should be conversant with load flow diagrams and voltage drop and short circuit calculations. The successful applicant will require to take standby duty in accordance with the above agreement. The classification and grading is E.7, salary £835/£880 per annum.

(2) THIRD ASSISTANT ENGINEER (Test), Area Transformer and Protection Test Department, Motherwell.

Candidates should have had experience in the repair and testing of power transformers and in the testing, commissioning, maintenance and repair of modern protective equipment and instruments. They should be conversant with voltage drop and short circuit calculations, H.V. fault location and testing techniques. The classification and grading is L.10, salary £995/£1,055 per annum.

(3) FOURTH ASSISTANT ENGINEER (Test), Area Transformer and Protection Test Department, Motherwell.

Candidates should have had experience in the testing, commissioning, maintenance and repair of modern protective equipment and instruments. They should be conversant with voltage drop and short circuit calculations and have had some experience of H.V. fault location. The classification and grading is L.13, salary £835/£880 per annum.

The successful candidate for each of these three appointments will require to reside within a reasonable distance of their respective offices.

Application forms, which may be obtained from the undersigned or any other Area Manager, should be forwarded to this office within 14 days of the date of this advertisement.

R. J. RENNIE,
Manager.

Montrose Crescent,
Hamilton. 4456

ASSISTANT SALES MANAGER

SIMPLEX ELECTRIC COMPANY LTD. are seeking a keen and energetic man, between 25 and 35, as Assistant Sales Manager of their Household Appliances Department. His duties would be concerned initially with the sales promotion of the Creda Debonair spin dryer and he would be based in London.

Sales promotional experience in the domestic appliance industry is essential.

Applications, giving full details of experience and salary required, to: Secretary, Simplex Electric Co. Ltd., Broadwell, Oldbury, Birmingham. 4423

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

ENGINEERING DRAUGHTSMAN (Civil), CONSTRUCTION DEPARTMENT, NORTH WILFORD POWER STATION
(Vacancy No. 97/58/ER).

Applicants should have experience in design and detail of reinforced concrete structure, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings.

The salary will be in accordance with Grade 6 (£595-£715 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 20th August, 1958.

ASSISTANT SHIFT CHARGE ENGINEER, NORTHAMPTON POWER STATION
(Vacancy No. 121/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class G, Grade 9 (£835-£880 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 20th August, 1958.

ASSISTANT MAINTENANCE ENGINEER (Mechanical), DRAKELOW "A" AND "B" POWER STATIONS
(Vacancy No. 123/58/ER).

Applicants should have received a sound technical training and have wide practical experience in the maintenance of power station mechanical plant.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership. The ultimate combined capacity of these stations will be 720 MW.

Salary will be in accordance with Class L, Grade 8 (£1,160 - £1,235 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th August, 1958.

ASSISTANT MAINTENANCE ENGINEER (Electrical), DRAKELOW "A" AND "B" POWER STATIONS
(Vacancy No. 124/58/ER).

Applicants should have received a sound technical training and have wide practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership. The ultimate combined capacity of these stations will be 720 MW.

Salary will be in accordance with Class L, Grade 8 (£1,160 - £1,235 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th August, 1958.

PLANT SHIFT CONTROL ENGINEERS, DRAKELOW "B" POWER STATION
(Vacancy No. 125/58/ER).

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience. Technical qualifications to Higher National Certificate desirable. The ultimate capacity of this station will be 480 MW.

Salary will be in accordance with Class J, Grade 10 (£885 - £930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 20th August, 1958.

ASSISTANT SHIFT CHARGE ENGINEERS, DRAKELOW "B" POWER STATION
(Vacancy No. 126/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class J, Grade 8 (£995 - £1,055 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 20th August, 1958.

ASSISTANT SHIFT CHARGE ENGINEER, STAYTHORPE POWER STATION
(Vacancy No. 127/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class K, Grade 8 (£1,065 - £1,140 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 20th August, 1958.

STATION SHIFT CONTROL ENGINEER, DRAKELOW POWER STATION
(Vacancy No. 131/58/ER).

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be an advantage.

Salary will be in accordance with Class J, Grade 10 (£885-£930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 27th August, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

DIVISIONAL CONTROLLER.

6th August, 1958. 4447

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Essex Sub-Area Headquarters

THIRD ASSISTANT ENGINEER, (Control (Shift Duties) (81/58.R).

Candidates should have had a wide experience in the operation and control of a large high voltage distribution system, be fully conversant with the Central Electricity Safety Rules (Distribution) and be capable of taking charge of all system operation, during their shift, in the Essex Sub-Area.

Salary N.J.B. Class L, Grade 10 (£995-£1,055), plus 10% shift allowance, plus London allowance.

Apply by letter, within 14 days, to E. A. Cullen, M.I.E.E., Engineer, Essex Sub-Area, Eastern Electricity Board, "Millfield," Bentley, Nr. Brentwood, Essex.

Fens Sub-Area Headquarters

FOURTH ASSISTANT ENGINEER (Planning and Development) (82/58.R).

The post provides an opportunity for a keen young engineer to gain experience and previous responsible experience is not essential, provided the candidates have had sound technical training.

Salary N.J.B. Class J, Grade 13 (£740-£785).

Previous applicants for this post need not reapply as their applications will be given automatic consideration.

Apply by letter, within 14 days, to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge.

Northmet Sub-Area, St. Albans District

THIRD ASSISTANT ENGINEER (Ref. 705) (83/58.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class F, Grade 9 (£790-£835).

Apply by letter to F. J. Drake, Assoc.I.E.E., Manager, Eastern Electricity Board, 107, St. Peter's Street, St. Albans, Herts., by 25th August, 1958. 4469

YORKSHIRE ELECTRICITY BOARD

No. 2 (Huddersfield) Sub-Area

PRINCIPAL ASSISTANT (Purchasing and Stores).

Applicants should have had experience in purchasing stores and equipment normally associated with electrical distribution work, service centre sales and office supplies. They must be capable of taking complete charge of the Purchasing Section, including the maintenance of records, order and invoice procedure, stock control, supervision of stores staffs, including manual workers, and the normal routine clerical work of a purchasing and stores section.

Salary N.J.C. Grade 7, £1,035/£30/£1,125 per annum.

HALIFAX DISTRICT

DEMONSTRATOR.

Applicants should have had training in domestic science, including electrical housecraft, should hold the E.A.W. Certificate for Demonstrators, and be capable of planning and giving cookery demonstrations, including lectures and advice to consumers on the use of domestic electrical appliances.

Salary N.J.C. Grade 1, £500/£20/£600 per annum.

Applications, quoting reference 2SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 29th August, 1958.

No. 5 (Wakefield) Sub-Area

BARNSLEY DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have had a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Candidates should preferably have attained the technical standard of the Higher National Certificate in Electrical Engineering or equivalent qualifications.

Candidates must be prepared to reside in the district and undertake standby duties.

Salary N.J.B. Class H, Grade 9, £885/£15/£930 per annum.

Applications, quoting reference 5SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 29th August, 1958. 4485

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Burton Street, Nottingham

Principal: D. A. R. Clark, M.Sc.(Tech.), M.I.Mech.E.

APPLICATIONS are invited for the following posts:—

1. SENIOR LECTURER IN ELECTRONICS.
2. LECTURER IN ELECTRICAL ENGINEERING, to specialise in telecommunications or heavy current.
3. ASSISTANT GRADE B IN ELECTRICAL ENGINEERING, mainly for radio and television service classes.

In the case of posts (1) and (2), the person appointed should be prepared to undertake or supervise research work as part of his teaching programme.

Salary in accordance with the Burnham Technical Scale as follows:—Senior Lecturer: £1,350 rising by annual increments of £50 to £1,550 per annum. Lecturer: £1,200 rising by annual increments of £30 to £1,350 per annum. Assistant Grade B: £650 × £25 to £1,025 per annum. Additions for Assistants include degree allowance of £75 per annum (or £125 for good honours degree), up to 3 increments of £25 for training in approved cases and incremental allowance for industrial experience after age 21, and war service.

In the case of posts (1) and (2), a salary above the minimum will be paid in approved cases.

Further particulars and form of application may be obtained from the Principal, to whom completed forms should be returned not later than 29th August, 1958. 4467

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Corporate Membership of I.E.E. or I.Mech.E. an advantage.

DEPUTY POWER STATION SUPERINTENDENT, BARKING "C" POWER STATION (Vacancy No. 58/603).

Sound technical training with experience in the general operation, maintenance and administration of a large modern power station coupled with successful record in staff supervision. Salary Class J, Grade 2 = £1,620 per annum.

DEPUTY POWER STATION SUPERINTENDENT, BATTERSEA POWER STATION (Vacancy No. 58/604).

Candidates should have had a responsible position of the operation and maintenance of large modern H.P. power station plant. Successful applicant will be responsible to the Station Superintendent for all aspects of work in station, and must possess proven ability in modern methods of personnel management. Salary Class L, Grade 2 = £1,885 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 25th August, 1958. 4454

AUSTRALIA

THE ENGLISH ELECTRIC COMPANY LIMITED require an ENGINEER of H.N.C. standard to take charge of an Impulse Test Plant mainly concerned with testing large transformers.

Previous transformer test experience is an advantage, but high voltage training will if necessary be given in this country before proceeding overseas.

This is a permanent appointment with good prospects for a suitable applicant.

Please write giving full details to

Dept. C.P.S.
Marconi House
The Strand, London, W.C.2

quoting reference ER.9902A.

4444

An opening has arisen for an

ELECTRICAL DRAUGHTSMAN

to do design work in connection with electrical installations in overseas factories of the DUNLOP GROUP. The person appointed will be employed at Fort Dunlop, Birmingham.

Applicants should be under 35 years of age, with an Ordinary National Certificate in Electrical Engineering. Experience of A.C. and D.C. motor control schemes, control gear layouts and H.T. and L.T. distribution systems is essential. The appointment is pensionable and offers a wide range of interesting work and future prospects.

Please write in confidence, giving age, experience and commencing salary expected, to the Personnel Manager (OE), Fort Dunlop, Erdington, Birmingham, 24.

4422

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

APPLICATIONS are invited for the following positions :—

ASSISTANT SHIFT CHARGE ENGINEER, POOLE GENERATING STATION (S/13.1024).

Applicants should have had previous experience in a large modern generating station, and preference will be given to those with experience of high operating temperatures and pressures, and pulverised or oil fuel firing equipment. Manufacturing works experience will be an advantage.

Preference will be given to those who possess qualifications leading to corporate membership of a recognised professional institution, or those holding appropriate equivalent qualifications.

Salary N.J.B. K/8, £1,065-£1,140 plus 10% shift allowance.

GRADE 10 ENGINEER, POOLE GENERATING STATION (S/13.1025).

The person appointed will be given an opportunity to gain experience on oil-fired plant operation, control room duties and maintenance work. Operating experience of modern generating station plant is essential.

Salary N.J.B. K/10, £935-£995 plus 10% allowance when on shift.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 27th August, 1958. 4474

TENDERING AND CONTRACTS ENGINEERING

'ENGLISH ELECTRIC'
STAFFORD

THE company wishes to appoint a number of electrical engineers to undertake technical co-ordination work at the tendering and contract stages in the following fields:—

MINING.
METAL INDUSTRIES.
INDUSTRIAL PLANT.
POWER TRANSFORMERS.
POWER SYSTEMS METERS AND RELAYS.
SWITCHGEAR.
RECTIFIERS.

Applicants should have relevant electrical engineering experience and hold an H.N.C. (E.) or equivalent qualification.

Junior engineers who are studying for their H.N.C. (E.) and are considered to have the ability to do this work will be considered for training.

These are pensionable appointments.

Please write giving full details to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting Ref. ER.1297T.

4431

INSPECTOR OF LIGHTS

required by SARAWAK GOVERNMENT MARINE DEPT. either on probation to pensionable establishment or on contract with gratuity of 12½% of final monthly salary for each completed month of service. Salary scale (including inducement pay) equivalent to £1,176 to £1,932 a year. Child allowance between £72 and £123 a year. Education allowance up to £280 a year. Outfit allowance £60. Free passages. Liberal leave on full salary.

Candidates, preferably under 35, should be A.M.I.E.E. or A.M.I.Mech.E. and have a good all-round knowledge of electricity, especially in connection with the operation of lighthouse flashers (Chance/Londex), Reed and Klaxon motors, echo sounding gear, otherwise straightforward small unit diesel electric generation, current conversion, etc., a knowledge and experience of small diesel engines, working knowledge V.H.F. radio equipment, and have a good head for heights up to 130 feet.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/50186/EF. 4421

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointment in the Distribution/Construction Section of the Chief Engineer's Department at Board Headquarters, Glasgow.

THIRD ASSISTANT ENGINEER (Electrical) (Reference No. E33/58).

Candidates should have experience in the construction of high-voltage outdoor substations for operation at 132 kV and 275 kV, and the handling of contracts therefor. Experience in the maintenance of such equipments would be an advantage, and technical qualifications leading to Corporate Membership of the Institution of Electrical Engineers are desirable.

Salary £1,055/£1,320 per annum in accordance with Class AX/EX, Grade 5 of Schedule B to the National Joint Board Agreement.

Apply, quoting reference number, on standard form AE.6, available from the Secretary, P.O. Box 173, 351, Sauchiehall St., Glasgow, C.2, not later than Friday, 29th August, 1958. 4446

THE GENERAL ELECTRIC COMPANY LIMITED

have vacancy for an

OPERATING ENGINEER

for their Power Plant Division based at Erith, Kent.

Duties include the commissioning and operation of turbo-alternator and turbo-blower plant at home and abroad and the site investigation of operating problems.

Applicants must possess initiative and determination, and the post would suit a Shift Charge Engineer in a large central power station. Minimum qualification Higher National Certificate.

Apply giving age and experience to—

Personnel Manager (FLT)
THE GENERAL ELECTRIC COMPANY LIMITED
Erith, Kent

4377

JOSEPH LUCAS (ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

COVENTRY CORPORATION

ASSISTANT ELECTRICAL ENGINEER required, Grade if qualified £750-£1,030 per annum. Commencing salary according to experience/qualifications. Experience design and supervision lighting and power installations in schools or other large buildings essential. Housing accommodation may be available. Removal expenses loan.

Application forms from City Engineer, Council House, Coventry, returnable by 26th August. 4470

***Situations Vacant** (continued)*

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

Wolverhampton and District Sub-Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (Lichfield).

Applicants should have a sound commercial background, including a thorough knowledge of modern sales methods and techniques, and should be capable of organising sales campaigns and sales promotion activities of all kinds. Preference will be given to applicants with a wide knowledge of electrical appliances and their installation. Salary £885/£930 per annum (N.J.B. E.6).

Apply by letter, within 14 days, to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington St., Wolverhampton.

Worcester and District Sub-Area

SENIOR DRAUGHTSMAN (Headquarters).

Applicants should have a good general and technical education, with experience in the preparation of engineering drawings, electrical diagrams and substation site layouts for 66 and 33-kV systems. Salary £760/£860 per annum (N.J.B. Schedule D, Grade 5).

Apply by letter, within 14 days, stating age, qualifications, present salary and position to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary. 4472

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

GENERAL ASSISTANT ENGINEER (Technical Operation and Efficiency) required at East Yelland Power Station. Superannuation scheme. Salary N.J.B. Class H, Grade 13, £685-£730.

Duties will be of a general engineering nature in connection with efficiency, instrumentation and technical records. Applicants should preferably possess the Higher National Certificate.

ASSISTANT SHIFT CHARGE ENGINEER required at Portishead "B" Power Station. Superannuation scheme. Salary N.J.B. Class K, Grade 8, £1,065-£1,140 plus 10% shift allowance.

Applicants should possess good technical qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear.

GENERAL ASSISTANT ENGINEER required at Plymouth "B" Power Station. Superannuation Scheme. Salary N.J.B. Class G, Grade 15, £540-£585.

Duties will be of a general engineering nature.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 25th August, 1958. 4477

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT COMMERCIAL ENGINEER, Public Lighting, West Kent District.

Salary £725 × £15 to £770 under N.J.B. Agreement, Class F, Grade 11. Superannuable.

The successful applicant will be required to supervise the erection and maintenance of street lighting equipment, to prepare street lighting schemes, and negotiate agreements with lighting authorities.

Applications on forms from District Manager, SEEBOARD, 286, High Street, Orpington, by 27th August, 1958.

DEMONSTRATOR, Sevenoaks and Reigate District.

Salary £500 × £20 to £600 per annum under N.J.C. Grade 1. Superannuable. Applicants should have diploma or certificate in domestic science, also E.A.W. Certificate. Duties include lecturing, demonstrating, advising consumers and generally assisting in any of the district's showrooms.

Applications on forms from District Manager, SEEBOARD, Electric House, West Hill, Oxted, by 27th August, 1958.

GEORGE WRAY,
Secretary.
4481

EAST MIDLANDS ELECTRICITY BOARD

Third Assistant District Engineer, Uttoxeter District, Derby and Burton Sub-Area

APPLICATIONS are invited for the appointment of a THIRD ASSISTANT DISTRICT ENGINEER in the Uttoxeter District of the Derby and Burton Sub-Area.

Candidates should have practical experience of the operation and maintenance of urban and rural distribution systems, and technical qualifications equivalent to the Higher National Certificate in Electrical Engineering would be an advantage.

The successful candidate will be required to undertake standby duties, and to reside in or near Uttoxeter.

The salary and conditions of the post will be in accordance with the National Joint Board Agreement, Class D, Grade 9 (£685 × £15 to £730 per annum).

Applications, stating age, education, qualifications, experience, present position and salary, should be addressed to the Manager, Uttoxeter District, Derby and Burton Sub-Area, 36, High Street, Uttoxeter, Staffs, so as to reach him within fourteen days of the issue of this advertisement. 4478

JOSEPH LUCAS (ELECTRICAL) LIMITED

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical machines and electro-magnetic devices. Projects will include fundamental design investigations, and full scope will be given for initiative and imagination.

The post is permanent and pensionable.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/221.

125

SOUTHERN ELECTRICITY BOARD

General Assistant Engineers (Two Vacancies)

Reading District of No. 2 (Newbury) Sub-Area, in each case. Salary N.J.B. Class J, Grade 16 (£590-£635 per annum). N.J.B. conditions of service.

The duties of post

(a) will be to assist with distribution duties, including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc.;

(b) will be to assist in the Planning Section of the District Engineer's Department.

Applications for either post should possess suitable technical qualifications.

The successful candidates will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.936, not later than 25th August, 1958. 4484

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a position as SHIFT CHARGE ENGINEER at Dalmarnock Generating Station, Glasgow. Applicants should have had experience with modern high pressure generating plant and, preferably, possess a Higher National Certificate in Electrical or Mechanical Engineering. Salary N.J.B. Class K, Grade 6, £1,235 × £30 to £1,325 per annum, plus shift allowance of 10%. The position is superannuable.

Forms of application may be obtained from the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, and should be returned not later than 29th August, 1958. 4483

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following positions based at Cwmbran in the Monmouthshire and Mid Wales Area of the Board :—

(a) SECOND ASSISTANT ENGINEER (Construction). Salary Class K, Grade 7 (£1,160/£1,235).

(b) GENERAL ASSISTANT ENGINEER (Construction). Salary Class K, Grade 13 (£790/£835).

The salaries mentioned above are in accordance with the National Joint Board Agreement for the Electricity Supply Industry.

Preference will be given to candidates possessing a Higher National Certificate in Electrical Engineering, or an equivalent qualification.

Applications stating age, present position, present salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Saturday, 23rd August, 1958. 4455

HUDDERSFIELD COLLEGE OF TECHNOLOGY

Principal: Dr. W. E. Scott, M.B.E.

Department of Electrical Engineering (Re-advertisement)

REQUIRED, September, 1958, or as soon afterwards as possible, LECTURER in Electrical Engineering. Applicants should be graduates of a British university and have had practical and teaching experience.

Salary Burnham Scale, £1,200 p.a. by £30 p.a. to £1,350 p.a. The starting salary, within this range, is determined in the light of previous experience.

Forms of application and further particulars obtainable from the Principal, College of Technology, Queen Street South, Huddersfield, to whom applications should be returned as soon as possible.

H. GRAY,
Clerk to the Governors.
31st July, 1958. 4430

ELECTRICITY AUTHORITY OF CYPRUS

SENIOR ELECTRICAL ENGINEER required for two tours each of two years with prospects of permanency or in certain circumstances on temporary terms. Salary (including bonus and overseas and temporary allowances) £2,530 a year. Superannuation scheme. Outfit and settling-in allowances £35 (£75 if accompanied by wife). Children's educational grants in certain circumstances. Free passages and furnished quarters. Liberal leave on full salary.

Candidates, preferably over 40 years of age, must have had a sound training in both electrical and mechanical engineering, with experience in charge of a District or its equivalent. They must possess a competent knowledge of the operation, maintenance and development of underground and overhead systems up to 11 kV, and be able to control clerical and technical staff, consumer relations and development.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/50183/EF. 4437

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Shin Generation Group

Vacancies for Group Control Engineers

APPLICATIONS are invited for the posts of GROUP CONTROL ENGINEER at Shin Power Station. Applicants should have technical qualifications up to H.N.C. standard, and preferably have experience in power station operation and high-voltage switchgear. A knowledge of hydraulics is also desirable.

The posts, which are superannuable, carry a salary scale N.J.B. F/7 (£885/£930) plus 10% shift allowance. A house to rent can be made available to the successful applicants within a short time of taking up their appointments.

Applications, stating age, qualifications and experience, should be submitted to the Generation Engineer, Shin Power Station, Invershin, Sutherland, not later than 14 days from the date of this publication. 4433

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments at Uskmouth Power Station, Newport, Mon.:—

SHIFT CHARGE ENGINEER
(Vacancy No. 77/58/ER).
Salary K.6, £1,235 to £1,325 per annum.
H.N.C. or equivalent qualifications desirable. Operating experience in a modern power station essential.

ASSISTANT SHIFT CHARGE ENGINEER
(Vacancy No. 78/58/ER).
Salary K.8, £1,065 to £1,140 per annum.
Experience in modern generating station essential; appropriate engineering qualifications and regular apprenticeship desirable.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-Fedwen Rd., Gabalfa, Cardiff, to be returned by the 27th August, 1958. 4473

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

A TECHNICAL EDITOR

is required in the Publicity Department at Trafford Park, Manchester. He should be interested in the clear and concise presentation of technical information. An ideal background would be a combination of engineering and writing.

The successful applicant will join the section responsible for the company's technical and commercial publications, which range from power station plant to scientific apparatus, and will work in close co-operation with the technical and commercial staff concerned.

Write giving details of age, education, training, experience, present position and salary to the Manager, Publicity Department, Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester, 17. 4361

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a position as SHIFT CHARGE ENGINEER at Portobello Generating Station, Edinburgh. Applicants should have had experience with high pressure pulverised-fuel generating plant and, preferably, possess a Higher National Certificate in Electrical or Mechanical Engineering. Salary N.J.B. Class K, Grade 6, £1,235 × £30 to £1,325 per annum, plus shift allowance of 10%. The position is superannuable.

Forms of application may be obtained from the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, and should be returned not later than 29th August, 1958. 4482

DEVELOPMENT LABORATORY ENGINEERS

MORPHY-RICHARDS Ltd., St. Mary Cray, Kent, require 4 Laboratory Engineers for an expanding department engaged in the design and development of electrical appliances. Commencing salary up to £950 p.a. depending upon experience and qualifications. Benefits include profit-sharing bonus and pensions scheme. The factory is close to St. Mary Cray Station, which is easily reached from Victoria or Holborn Viaduct.

Qualified engineers with experience in light electrical/mechanical industry are invited to write or telephone P. D. Nunn, Orpington 27000. 4448

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

ELECTRICAL FITTER and HANDYMAN required for automatic and electronically operated boiler plant at new office building near Paddington Station. Responsible for electrical and mechanical services operational maintenance. Salary 5s. 2½d. an hour for a 44-hour week.

Apply immediately to the undersigned at 11a, Portland Place, London, W.1, giving age, present appointment and previous experience, with the names and addresses of two professional referees.

E. G. BRAITHWAITE,
Secretary.
4471

INSPECTORS OF WORKS (ELECTRICAL)

required by the GOVERNMENT of the NORTHERN REGION of NIGERIA on contract for one tour of 12-24 months in first instance.

Salary scale (including inducement addition) £810 rising to £1,386 a year. Commencing salary according to age and experience. Gratuity at rate of £100/£150 a year. Clothing allowance £45. Free passages for officer and wife. Assistance towards children's passages and grant up to £288 annually. Liberal leave.

Candidates, under 45 years of age, should have served an apprenticeship to electrical installation work and must have had at least 5 years' responsible experience in electrical contracting including modern methods of installation. They should have a knowledge of electrical maintenance of air conditioning plant and oil engined standby generating plant.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/50228/EF. 4480

ELECTRICAL MAINTENANCE SUPERVISOR

AN ELECTRICAL MAINTENANCE SUPERVISOR is required by Texaco Trinidad, Incorporated, for their oil refinery in the West Indies.

Applicants should have specialised knowledge of the plumber jointing of underground H.T. cables up to 11 kV and be capable of training men in this work. They should also preferably have experience of erecting overhead transmission lines. General technical education should be to O.N.C. level, and the preferred age range is 26-30 years.

This position should appeal to a man already in a supervisory position and earning up to £1,100 per annum in the U.K. Schooling for children and accommodation are available at subsidised rates.

Please write with brief particulars to the Personnel Officer, Trinoil (U.K.) Limited, Trinidad House, Old Burlington Street, London, W.1. 4435

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

OPERATION SUPERINTENDENT is required at Meaford "B" Power Station, Stone, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J.4, £1,325-£1,415 per annum.

Applicants should have received a sound technical and practical training, and should have considerable experience in the operation and maintenance problems arising in a power station. The possession of a recognised technical qualification will be an advantage.

Apply, quoting Vacancy No. 850MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 28th August, 1958. 4476

E.C.C. (MOULDED BREAKERS) LTD.

Bushbury Engineering Works
Wolverhampton

Attractive vacancies exist for

A WORKS MANAGER

and also

A PRODUCTION ENGINEER

with sound training and with experience in "flow" manufacture of light engineering equipment.

First-class working conditions.

Excellent opportunity for the right applicants.

Write in first instance, giving full details of training and experience, to Mr. H. E. Laflin at the above address. 4434

ELECTRICAL DESIGNER

APPLICATIONS are invited for an ELECTRICAL DESIGNER with experience in the design of A.C. motors up to 3.3 kV.

This is a permanent post, also offering excellent experience and varied work other than machine design to man who is capable of accepting responsibility and working with minimum supervision.

Salary commensurate with experience and technical qualifications.

Box 4486.

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 75/ER/58

APPLICATIONS invited for superannuable N.J.B. appointment of THIRD ASSISTANT ENGINEER (Analyst) in the GENERATION (Operation) DEPARTMENT at DIVISIONAL HEADQUARTERS.

Salary AX/DX6, £895-£1,110 per annum.

Candidates, who should have a degree or equivalent in chemistry, must have a flair for analytical work. Duties will consist mainly of non-routine, inorganic and physico-chemical analytical investigations.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-Fedwen Road, Gabalfa, Cardiff, to be returned by the 26th August, 1958. 4429

NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the appointment of DISTRICT COMMERCIAL ENGINEER, Sunderland District. Duties of the post include responsibility for commercial administration of the district, control of service centre, contracting and consumer service arrangements. Applicants should preferably have technical qualifications and wide experience in the commercial organisation of the electricity supply industry. Salary Schedule A, Class F, Grade 3, £1,160/£1,235. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 4487

ASSISTANT POWER STATIONS SUPERINTENDENT

AN ASSISTANT POWER STATIONS SUPERINTENDENT is required by Texaco Trinidad, Incorporated, for two power stations with a combined installed capacity of 23,000 kW and associated steam, compressed air and water-treating plant, at their oil refinery in the West Indies.

Applicants should preferably be A.M.I. Mech.E., aged 30-35 years, and have at least 7 years' experience of the operation of modern turbo-generators and gas and oil-fired boilers.

Salary will be not less than £1,400 per annum, and subsidised accommodation and schooling for children are available.

Please write with brief particulars to the Personnel Officer, Trinoil (U.K.) Limited, Trinidad House, Old Burlington Street, London, W.1. 4436

EASTERN ELECTRICITY BOARD

Essex Sub-Area

FITTER (Electrical), THURROCK DISTRICT). General experience of electrical fitting work is necessary with particular reference to substation construction, the erection of high and low voltage switchgear and the installation of transformers.

Remuneration and conditions of employment will be in accordance with N.J.I.C. Agreement for the Electricity Supply Industry. The present rate of pay is 4s. 11½d. per hour, for a 44-hour week, plus 8s. 3d. per week productivity allowance.

Apply by letter, within 14 days, to H. J. Unwin, A.M.I.E.E., Manager, Thurrock District, Eastern Electricity Board, Maidstone Rd., Grays, Essex. 4468

ARMATURE winder. Progressive firm requires for repair shop a winder having sound knowledge all types A.C. and D.C. work. This company has other activities and there are good prospects of advancement for skilled man with initiative and some administrative ability. Write to Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 224

ASSISTANT storekeeper required by electrical wholesalers. Preferably experienced in dealing with installation supplies. Good prospects. Apply giving experience, salary, age, etc., to—Supra Elec. Co. Ltd., 26, Soho Square, London, W.1. 4439

***Situations Vacant** (continued)*

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (Construction) required at No. 3 Sub-Area Headquarters, Chester. Salary £1,160/£1,235 per annum (N.J.B. K.7).

Applicants should have considerable experience in the construction of H.V. and M.V. distribution networks, including substations and associated equipment at supply points, underground cables and overhead lines, and should possess appropriate technical qualifications.

Appointment subject to medical examination. Pension scheme.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Merseyside and North Wales Electricity Board, Newgate Street, Chester, must be forwarded not later than 26th August, 1958. 4479

A POSITION with unusually good prospects occurs in the London office of West Country firm manufacturing small electrical components. Design experience in this class of product with knowledge of relative B.S.I. requirements, and experience of light assembly and press tool design essential. Knowledge of plastic moulding an advantage. Applicants should hold H.N.C. (Elec. or Mech. Eng.) or equivalent. Fullest details please, to—Box 4418.

CONTROL gear engineer required, age 23-35, for layout and circuiting of contactor equipment. Good salary. Permanent and progressive position. Canteen, pension scheme. Write stating age, experience and qualifications, if any, to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 273

CROMPTON PARKINSON Ltd. require contract engineer familiar with 33 kV and 66 kV outdoor switchgear layout, capable of preparing or supervising preparation of substation layout drawings, of specifying steelwork and ancillary equipment, also technically qualified to prepare tenders and process orders for complete outdoor switching stations. Location, Chelmsford. Superannuation scheme. Write stating age, full details previous experience and salary required to Contract Dept., Chelmsford. Ref. 1Co. 4488

DESIGN engineer with H.N.C. required for interesting and varied work on power transformers and voltage regulating devices. Company expects to pay not less than £950 p.a. Modern factory 30 miles from London. Housing available. Superannuation scheme. Apply in confidence giving academic qualifications and career to date.—Box 4449.

DRAKE & GORHAM (CONTRACTORS) Ltd. have a vacancy for a supervising engineer to assist the manager at their Cardiff office. Applicants should write stating age, details of experience and salary expected to—36, Grosvenor Gardens, London, S.W.1. 4458

DRAUGHTSMAN required for development and contract work in connection with H.V. overhead line switchgear and interrupter devices. Excellent working conditions. Good prospects. Superannuation scheme. Write giving details of experience to—Hackbridge & Hewittic Electric Co. Ltd., Walton-on-Thames, Surrey. 4440

DRAUGHTSMEN, both senior and junior, required. Applicants should have either contract development or diagram experience on switchgear up to 11 kV, although men with good electrical or mechanical knowledge will be considered. Excellent working conditions. Good prospects. 5-day week. Superannuation fund. Interviews arranged Saturdays if desired. Apply giving full details of training and experience to—Personnel Officer, Crompton Parkinson (Chelmsford) Limited, Chelmsford, Essex. 389

ELECTRICAL engineer. Extensive new construction taking place at the Swansea Vale Works of the National Smelting Co. Ltd., makes necessary the temporary employment, until 31st December, 1960, of a site electrical engineer. He will be responsible to the group electrical engineer for the installation and commissioning, by contract, of all electrical equipment. Applications are invited from men who have served an electrical apprenticeship and hold a qualification of at least H.N.C. standard in electrical engineering. 5 years' supervisory experience in electrical installation work is essential. Write for application form to—Personnel Manager, Imperial Smelting Corpn. Ltd., Avonmouth, Bristol, quoting reference ESV/ER. 4489

EDITORIAL assistant (age approx. 25-30) required by large professional engineering institution. Engineering or science degree necessary, with some engineering experience and the ability to sub-edit high-class technical copy. Knowledge of foreign languages an advantage. Commencing salary £800-£1,000, depending upon age, qualifications and experience. Superannuation scheme.—Box 4459.

ELECTRICAL draughtsman for switchboard layouts, etc. Permanent position. Salary by agreement. Please write—Chief Draughtsman, Astral Switchgear Ltd., Alma Rd., Enfield, Middx. 4385

ELECTRICAL engineers and contractors require engineer experienced construction steel tower and wood pole overhead lines. Excellent prospects. Pension scheme. Write age and experience.—Box 4316.

ELECTRO-mechanic improver required for totalisator department as assistant to chief mechanician. Apply, giving full particulars and salary required, to—Totalisator Director, Romford Stadium, London Rd., Romford, Essex. 4493

ENGINEERING organisation offers an engineer an opportunity in their sales department. The duties will be in connection with electrical equipment for the machine tool industry and will entail advice to customers, preparing of quotations, processing of orders and servicing. Knowledge of the design of machine tools would be required. Applications to—Box 4320.

ENGINEERS for overhead and underground distribution schemes required by electrical engineers and contractors. Excellent prospects. Pension scheme. Give age and experience.—Box 4317.

ESTIMATOR required for N.W. London firm of contractors; experienced in industrial and council installations. Apply giving age, salary required and details of experience. —Box 4374.

EXPERIENCED manager required for busy electrical showrooms. Conversant with all phases of buying, sales promotion and staff control. Excellent prospects for right man. Pension scheme. Salary £700 per annum plus commission. Possible assistance with accommodation. Apply stating age and previous experience to Sales Director, Sharpe & Fisher Limited, Cheltenham. 4460

JUNIOR engineer required for work in sales office concerned with preparation of tenders for switch and control boards in small manufacturing unit. Constructive and interesting work which would suit a young man wishing to extend his experience. — Astral Switchgear Ltd., Alma Road, Enfield, Middx. 4371

KEEN young draughtsman with machine shop training required for small production drawing office of company engaged in the manufacture of control gear equipment. Electromechanical experience desirable but not essential. Permanent and progressive position. 5-day week, pension scheme, canteen, etc. Apply giving full details of age and previous experience to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middx. 278

LONDON electrical contractors require estimating engineer. Reply giving full details of previous experience and salary required to—Box 4424.

ONE assistant mechanical and electrical engineer required for plant operation and maintenance on Nauru or Ocean Island, Central Pacific. Salary £975 p.a. Australian currency plus qualification and child allowance where applicable. Free housing, partly furnished, and free board or allowance in lieu thereof. No income tax payable. Qualifications—under 30 years of age; standard required up to G.I. Mech.E. or equivalent. Term of service 3½ years with intermediate leave after 21 months. Apply the British Phosphate Commissioners, 2, Grosvenor Gardens, London, S.W.1, enclosing full particulars of experience and education. 4425

PILKINGTON BROTHERS Limited have vacancies for furnace design draughtsmen. Experience in the design of glass furnaces is an advantage but is not essential. Salaries are assessed in accordance with age, qualifications and experience and will be reviewed annually. Contributory superannuation and widows' pension fund are in operation and there are excellent canteen, welfare and recreational facilities. Apply, stating age, qualifications and experience to the Group Chief Engineer, Pilkington Brothers Limited, St. Helens, Lancashire. 4438

PROMINENT London wholesaler has vacancy for a representative with Central London connection.—Box 4461.

REPRESENTATIVE required for South Wales area for sales of space heating products, bell and indicator equipment, etc., manufactured by two well-known organisations. Must have experience in selling products of this nature in the area, and reside in Cardiff or Newport districts. Technical knowledge advantage but not essential. Will be required to work in conjunction with manufacturers' area office in Bristol. Salary, bonus, car. Send full details in confidence to—Box 4450.

ROYAL NAVAL SCIENTIFIC SERVICE requires senior scientific officers and scientific officers for establishments in London area, Baldock, Portsmouth, Portland, Poole, Greenock and Rosyth. Main requirements are about 25 vacancies for physicists, electronic engineers and mathematicians in areas specified. The following particular vacancies also exist: mechanical engineer for work on gas turbine problems in the London area; mechanical engineer for work on design and development of u/w devices in Portland area; metallurgists for Rosyth and Poole; chemists (physical and inorganic) for Poole area, Baldock and London. Candidates must normally be natural-born British subjects of natural-born British parents, with at least first or second class honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be not less than 26 years of age. Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between the ages of 21 and 32 to compete for established posts. Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A98/8A. 4257

SALES order clerk required. Senior post, well paid position offering scope in the future. Superannuation scheme, canteen and social club facilities. Experience of electrical wholesaling essential. Apply to—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 4263

SALES promotion and publicity. Splendid opportunity exists with Higgs Motors Ltd., Witton, Birmingham, for ambitious and enthusiastic young man about 35 years old or younger. Must have knowledge of electric motors and a keen interest in publicity work. Apply giving age, qualifications and salary required. 4383

SALES representative to cover North and East London and East Anglia required by electrical instrument and relay manufacturer. Apply by letter to—Sales Manager, Measuring Instruments (Pullin) Ltd., Winchester Street, Acton, London, W.3. 4451

STOREKEEPER required, must be experienced and fully conversant with electrical wholesale trade. Good wages and conditions, superannuation scheme, canteen and social club facilities. Apply to—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 4264

SWITCHGEAR and motor control gear manufacturer in the N. East requires capable designer engineer in L.V. range. Good opportunities for right man, state qualifications, experience and salary in confidence, to—Box 4419.

TECHNICAL assistant with sound knowledge in general electrical engineering, qualified at least to H.N.C. standard, required as technical sales engineer by agents for well-known Continental electrical engineering organisation. The work is of wide range and interesting. Applicants preferably should have knowledge of German but this is not essential, and they should be between 25 and 40 years of age. Write with full details of education and experience to—Box 4319.

THE position of electrical superintendent on a rubber plantation in West Africa will shortly become vacant. The scope of work covers both new installation and maintenance of all electrical plant on the plantation buildings, factories, houses, hospitals, including hydropower and auxiliary diesel plant; also the responsibility for recommending to the higher management, with layouts and sketches, costs and savings, new work and maintenance. The applicant should have at least 6 years' practical working experience, which should include power house operation, and should not be over 45 years of age. Applications in the first instance to—Box 4441.

WE require several good electricians for industrial installations in all parts of the country. Good tradesmen who are prepared to work should apply to—David Thomson Electrical Engineers Ltd., 26, Albion Road, Luton, Beds (Phone 4178). 4442

WHOLESALE electrical distributors require sales representative for Cambs area. Knowledge of trade and car owner an advantage. Apply giving details of past experience, age and salary to—Box 4426.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

CHARGEHAND (38), supervising experience abroad, seeks situation, pref. overseas; previous experience on large installations, hospitals, H.V. overhead transmission, etc.—Box 9446.

ELECTRICAL supervisor and foreman with overseas experience on diesel alternators up to 2,000 kVA. Transformers, high vokage switchgear, lifts, etc. Construction and testing. Seeks further overseas employment.—Box 9447.

ARTICLES FOR SALE

BOROUGH OF GILLINGHAM

Trunk Road A.2: Street Lighting

Disposal of Salvaged Fittings

TENDERS are invited for the following secondhand Group A Street Lighting equipment :—

(a) 50 REVO "Silvergold" (1¼" top entry) Lanterns for 140-watt Sodium Lamps.
(b) 2 REVO "Silverblue" (1¼" top entry) Lanterns for 400-watt horizontal burning high-pressure Mercury Vapour Lamps.
(c) 9 B.T.H. "Dillon" (top entry) Lanterns for 400-watt vertical burning high-pressure Mercury Vapour Lamps.
(d) 80 PHILIPS "Philora" 140-watt Open Type Leak Transformers.
(e) 5 G.E.C. 400-watt Open Type Chokes.
(f) 90 T.C.C. 20 M.F.D. Capacitors.

The whole of the equipment will be available on the completion of a street lighting improvement scheme, but samples may be inspected at the Council Depot (Stores Superintendent), Pier Approach Road, Gillingham, Kent, at all reasonable hours.

Tender documents may be obtained from the Borough Engineer, Municipal Buildings, Gillingham, Kent, and should be returned to the undersigned by not later than 9 a.m. on Monday, 1st September, 1958.

The Council do not bind themselves to accept the highest or any tender and the equipment is offered as seen, no guarantee being given or implied by the Council.

FRANK HILL,
Town Clerk.
Municipal Buildings,
Gillingham, Kent.
9th August, 1958. 4475

MOTORS

Commutator Type Variable Speed A.C. Motors, Moving Brush Type, 3/50/400-440 volts

H.P.	Revs.	Maker.
90/30	680/227	B.T.H.
45/4.5	2400/250	B.T.H.
30/5	720/120	A.S.E.A.
30/6	1500/300	B.T.H.
20/10	1400/700	B.T.H.
16/1.35	1600/160	HOLMES REYROLLE
5	1200/600	METRO-VICK

THOMAS MITCHELL & SONS LTD.
Bolton
4305

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.
UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

DISPOSAL OF SURPLUS PLANT

OFFERS are invited for the purchase of the following plant at Thurso :—

(a) BRUSH Diesel Engine (1935), complete with alternator, 110 kW, 400 volts, 195 amps., 1,000 r.p.m. (3-phase).
(b) BLACKSTONE E.P.V. 5-cylinder Diesel Engine (1935), complete with alternator, 120 kW, 415 volts, 209 amps., 600 r.p.m. (3-phase).
(c) BLACKSTONE E.P.V. 4-cylinder Diesel Engine (1936), complete with alternator, 93 kW, 400 volts, 192 amps., 600 r.p.m. (3-phase).

Enquiries to and form of tender from Area Manager, North of Scotland Hydro-Electric Board, Church Street, Dingwall.

Tenders should be received not later than Monday, 1st September, 1958. 4462

T.W.W.

Large A.C. Motors
3-phase, 50 cycles

Maker	H.P.	Volts	R.P.M.
B.T.H.	1820	3.3 kV	368
B.T.H.	1800	400/440	368
MATHER & P.	350	400/440	720
METRO-VICK.	310	400/440	1440
MATHER & P.	300	400/440	720
BRUSH	250	400/440	420
B.T.H.	250	400/440	480
MATHER & P.	200	400/440	960
BROOK	110	400/440	580

THOS. W. WARD LIMITED
Albion Works, Sheffield
(Phone 26311, ex. 347; Grams, "Forward") 321

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., 1/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.
ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220v. D.C. to 230/1/50 A.C., 125 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR disposal: 110 English Electric motors, 3 h.p., A.C., 400/440 volts, 3-phase, 950 r.p.m., new condition.—Box 4463.

FOR sale, Ward Leonard sets in a great range of outputs, speeds and control systems.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 4492

FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc.—Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW, A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

MOTOR generator sets and converters, all sizes and voltages from ½kW up to 500kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

***Articles for Sale** (continued)*

MOTORS, starters, circuit breakers. Huge stocks of all types, ½ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & Co. Ltd., Bow St., Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons, Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switchholder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & polyphase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converter, input 440 volts, 3-phase, 50 cycles, 80 kVA, output 480 volts D.C., 70 kW, 146 amps. Apply—A. C. Dibley & Co. Ltd., 72, Granville Road, London, N.W.2. 4452

ROTARY converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

SECONDHAND electrical plant can be as good as new if you buy it from specialists. Write for our stock list. — Dynamo & Motor Repairs Ltd., North End Road, Wembley Park, Middlesex (Telephone, Wembley 3121); Soho Road, Handsworth, Birmingham (Telephone, Birmingham Northern 0898). 73

SLYDLOK fuses for sale.—Ryness Supplies, 37, Goodge Street, London, W.1. 284

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TRANSFORMERS, oil cooled, 3-phase, 2,000 kVA, 11 kV/3.3 kV, outdoor 41 DY 11, price £675. 300 kVA, 11 kV/440/230. Rectifier, glass bulb, 300 kW, 11 kV/3.3 kV, output 500 v. D.C.—Sanger, 89 Weoley Park Road. Birmingham, 29 (Tel. SEL. 2056). 9435

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps, from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

500 300, 100-amp. G.E.C. heavy ironclad sw/fuses, D.P. 60 amp., 6-way, 20 amp. 10-way ditto. fuseboards, tested and approved. 19.083" Hitest V.I.R. cable, J. & P. cable boxes, Walsall screwed cond. ftgs. All brand new, not unwrapped. Sacrifice at bargain prices.—Wings, 195, High St., W. Wickham, Kent (SPR. 1980). 4490

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service.—Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return.—Whitetrade Limited, Rochester, Kent (Tel. Chatham 41133, 3 lines). 294

ARTICLES WANTED

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc.—109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

QUICKSILVER & beryllium copper urgently required for best prices and prompt cash.—Sterling Products Ltd. (Ealing 9248). 293

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

TWO 14-kVAr capacitors, tank type, for 415/3/50.—Burleigh, Alpine Wks., Empire Way, Wembley, Middlesex. 4219

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, one 80-h.p. slipring protected type motor preferably with starter at 720 r.p.m. and suitable for 400/3/50 supply. Standard frame which would rewind acceptable.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 4491

WANTED, redundant A.C./D.C. electric motors, transformers, generators and stocks of cables.—S. Hyams, 129, Lambs Lane, Rainham, Essex (RAI. 4896). 9441

WANTED, rotary converters, any sizes.—Universal, 221 City Rd.,London E.C.1 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

LIGHT assembly or development work required under control of A.M.I.E.E. of wide experience. Secrecy guaranteed if required.—Advertiser, Madeira, Mill Gap Rd., Eastbourne 8050. 9444

REWINDS up to 50 h.p. Vac. arm. (10-12 slots) rewound, 30s., post 31s. 6d.—Finchley Rewinds, 23 South Rd. Edgware (Tel. 3770). 9403

SMALL armature, stator, transformer and general coil winding undertaken on production run.—Kensal Electrics Ltd., 151, Kensal Rd., London, W.10 (LAD. 4530). 202

BUSINESS OPPORTUNITIES

A.M.I.E.E. holding patent would be pleased to hear from firms interested in ultra-modern fluorescent lighting fittings. To live firm willing to accept my services as consultant in making and marketing there is money to be made.—Advertiser, Madeira, Mill Gap Road, Eastbourne 8050. 8445

PATENT NOTICES

THE proprietors of Patent No. 713174 for "Improvements in or relating to flame-resistant insulated conductors" desire to secure commercial exploitation by licence or otherwise in the United Kingdom. Replies to—Haseltine Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2. 4464

EDUCATIONAL

UNIVERSITY OF MANCHESTER

THE NEXT SESSION COMMENCES ON THURSDAY, 2nd OCTOBER, 1958 4443

CITY & Guilds (Electrical, etc.) on "No Pass —No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook. Free and post free.—B.I.E.T. (Dept. 12A), 29, Wright's Lane, London, W.8. 100

BOOKS, INSTRUCTIONS, ETC.

"SHORT-WAVE Radio and the Ionosphere." By T. W. Bennington. This book shows how existing ionospheric data can be applied to everyday problems of short-wave transmission and reception. 2nd Edition. 10s. 6d. net from all booksellers. 11s. 4d. by post from Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1. C7

CLASSIFIED ADVERTISEMENTS ARE PREPAID

COMPANY MEETINGS

HACKBRIDGE AND HEWITTIC ELECTRIC

A Successful Year

THE 52nd annual general meeting of Hackbridge and Hewittic Electric Company Limited was held on 6th August in London, Mr. Anthony M. Browne (chairman and managing director) presiding.

The following is an extract from his circulated statement:—

The trading profit of the Group amounts to £480,863 against £434,690 for the previous year. The improvement in the Company's results stems directly from the steps taken during the past few years in improving the manufacturing facilities in the factory.

As mentioned in my last report, facilities have been provided in the factory for the manufacture of a considerably greater proportion of transformers of the largest sizes in accordance with the highest technical and economic standards. We also had an order book enabling us to take full advantage of the production facilities during the past year; coincidentally we have been able to increase output of the medium and smaller power transformers.

The Rectifier Division was also well placed with orders. The rectifiers manufactured throughout the year had the benefit of many improvements in design. As a result a record output was obtained for Mercury Arc Rectifiers.

Thus the reduced profit margins generally prevalent were offset over the year by the benefits accruing from capital expenditure, development work and resulting improved designs, and consequent increased output and productivity.

Essentials for Future Prosperity

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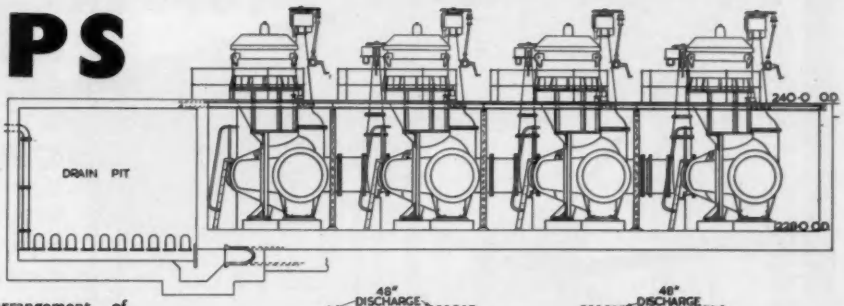
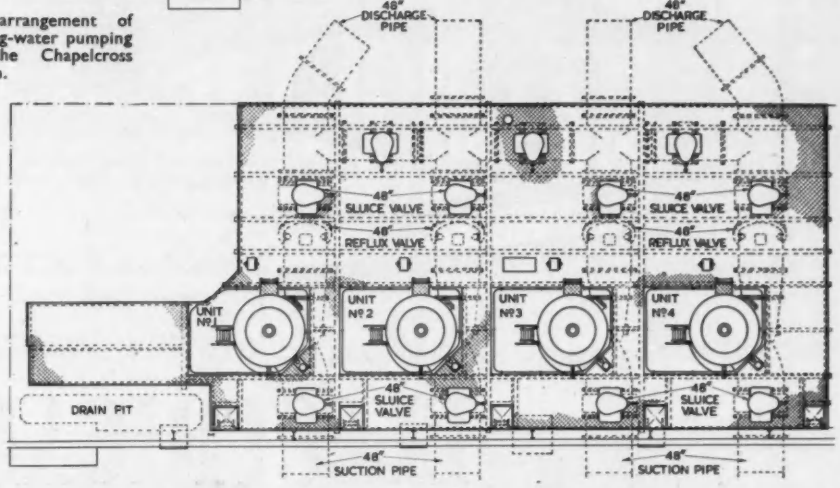


Installation arrangement of the circulating-water pumping units at the Chapelcross Power Station.



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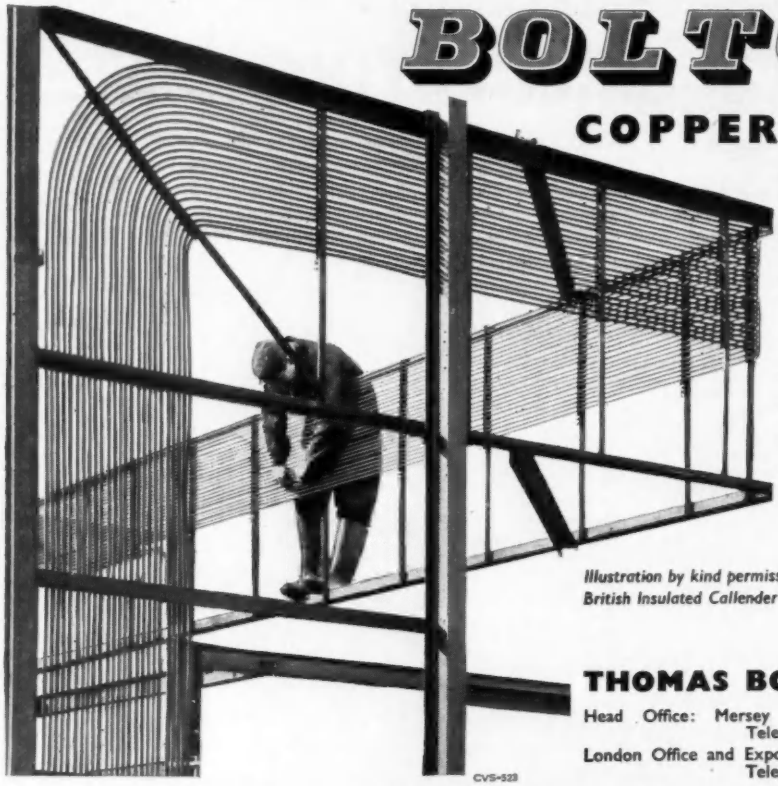

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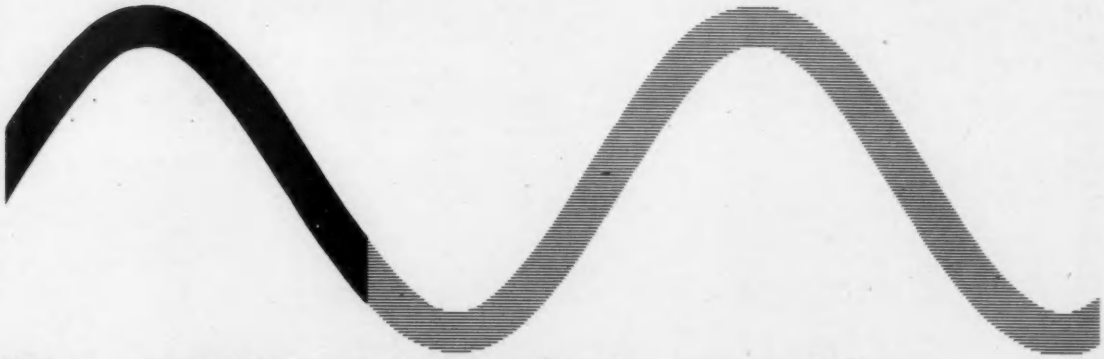

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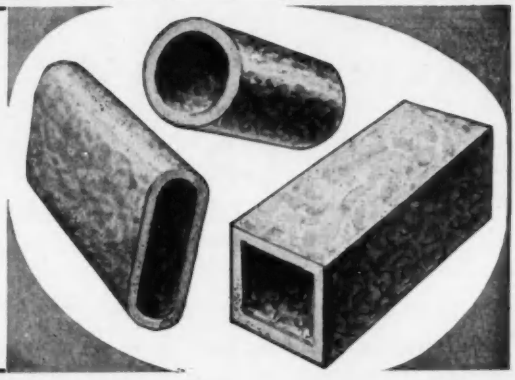

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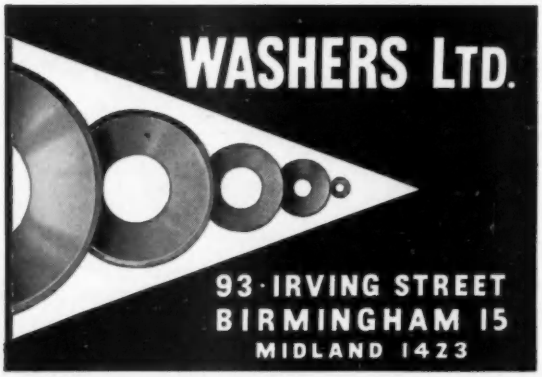

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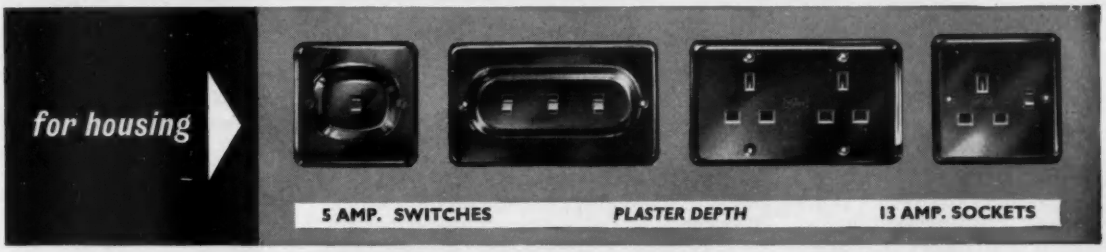

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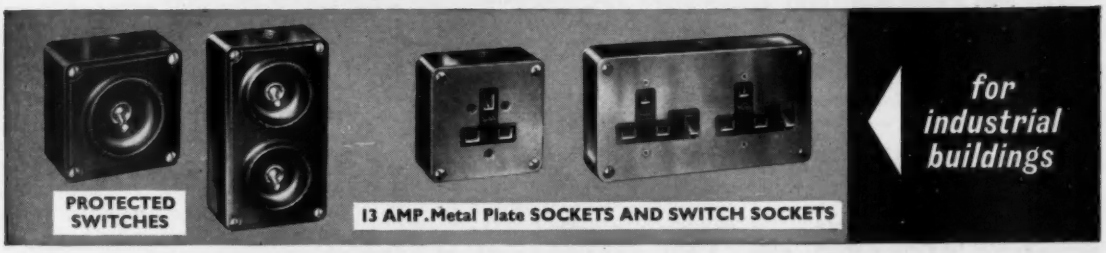

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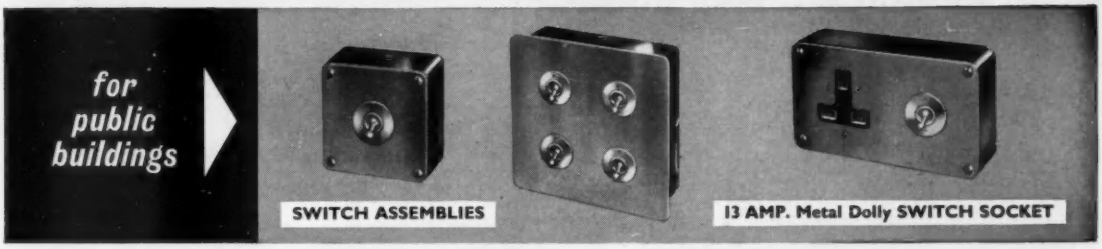

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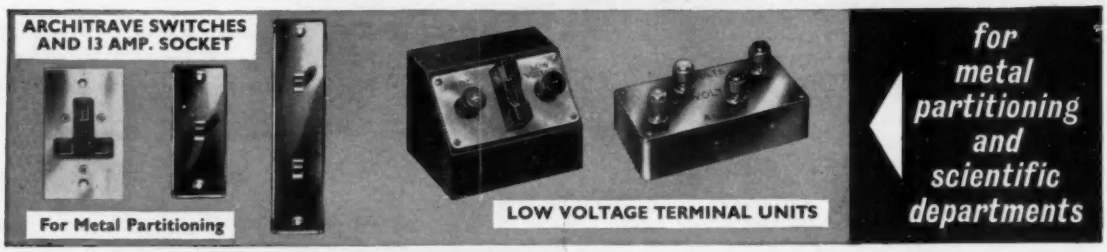
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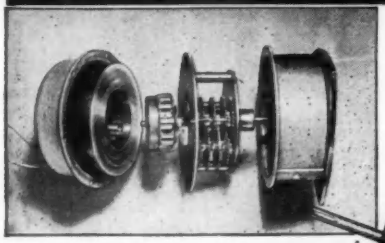

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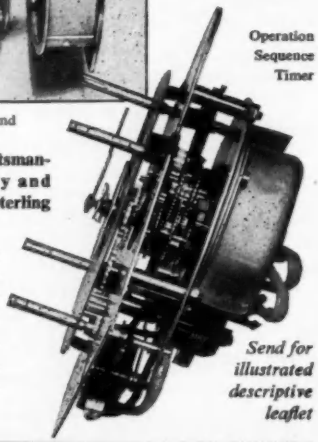

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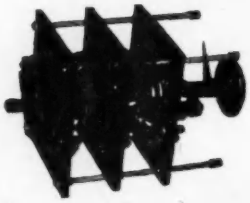

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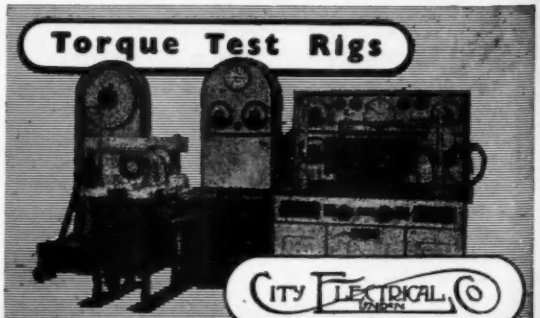

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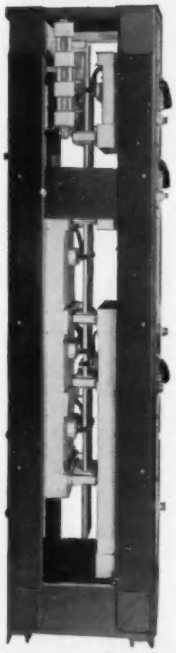

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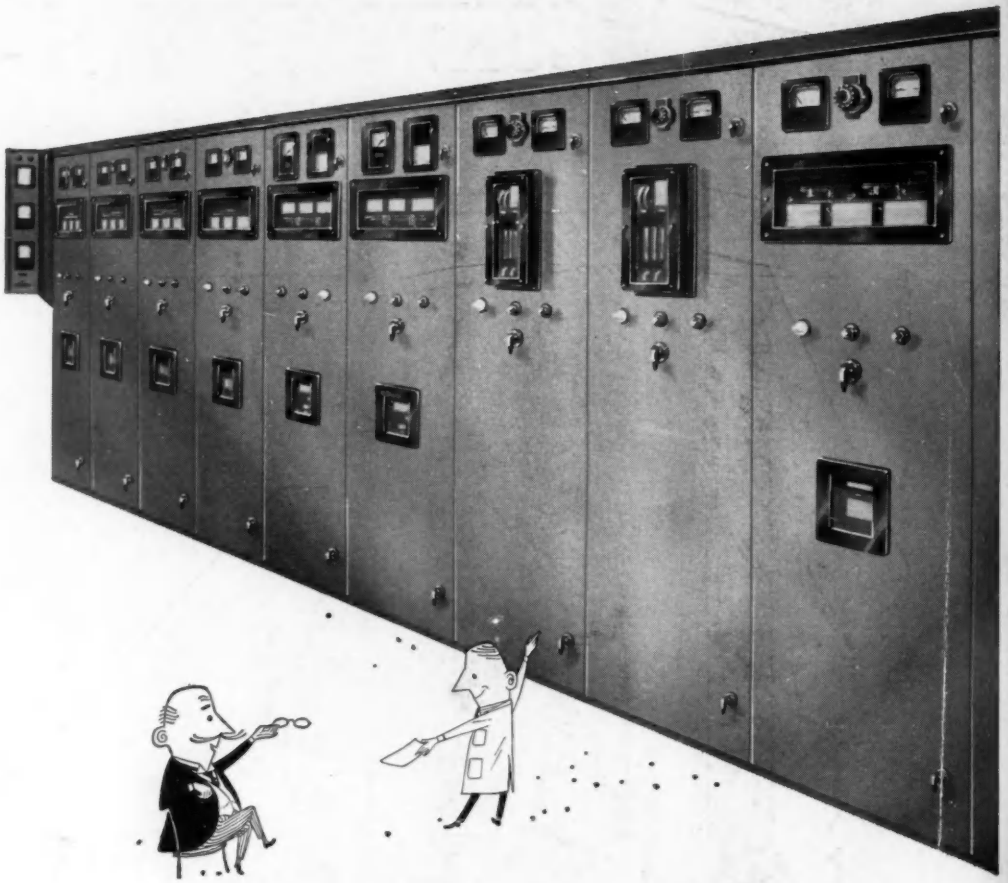

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